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VOL. 6

NO. 1

UNITED STATES NAVAL MEDICAL BULLETIN

FOR THE
INFORMATION OF THE MEDICAL
DEPARTMENT OF THE SERVICE

LIMITED TO PROFESSIONAL MATTERS AS OBSERVED BY MEDICAL
OFFICERS AT STATIONS AND ON BOARD SHIPS IN EVERY
PART OF THE WORLD, AND PERTAINING TO THE PHYS-
ICAL WELFARE OF THE NAVAL PERSONNEL

JANUARY, 1912

(ISSUED QUARTERLY)



WASHINGTON
GOVERNMENT PRINTING OFFICE
1912

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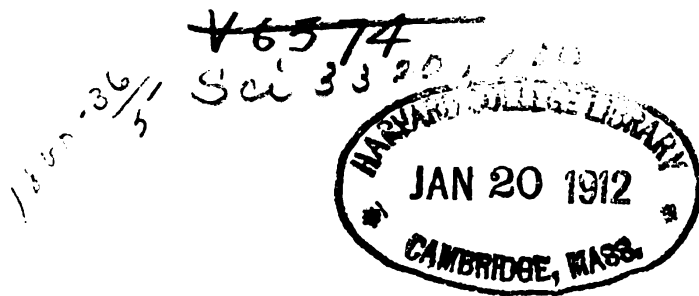
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NAVY DEPARTMENT,
Washington, March 20, 1907.

This United States Naval Medical Bulletin is published by direction of the department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.

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P R E F A C E .

The publication and issue of a quarterly bulletin by the Bureau of Medicine and Surgery contemplates the timely distribution of such information as is deemed of value to the medical officers and the Hospital Corps in the performance of their duties, and with the ultimate object that both shall continue to advance in proficiency in respect to all of their responsibilities.

It is proposed that the Naval Medical Bulletin shall embody matters relating to hygiene, tropical and preventive medicine, pathology, laboratory suggestions, chemistry and pharmacy, advanced therapeutics, surgery, medical department organization for battle, and all other matters of more or less professional interest and importance under the conditions peculiar to the service and pertaining to the physical welfare of the naval personnel.

It is believed that the corps as a whole should profit, to the good of the service, out of the experience and observations of the individual. There are many excellent special reports and notes beyond the scope of my annual report being sent in from stations and ships, and by communicating the information they contain (either in their entirety or in part, as extracts) throughout the service, not only will they be employed to some purposes as merited, but all medical officers will thus be brought into closer professional intercourse and be offered a means to keep abreast of the times.

Special attention will be given by the instructors of the Naval Medical School to the review of advances in medical science of special professional interest to the service, as published in foreign and home journals, and extracts from these will appear in the bulletin, together with such remarks as the instructors may deem of value to officers on foreign service or sea duty.

Information received from all sources will be used, and the bureau extends an invitation to medical officers to prepare and forward, with a view to publication, matter on subjects relating to the profession in any of its allied branches.

C. F. STOKES,
Surgeon General, United States Navy.

(v)

SPECIAL ARTICLES.

THE MEDICAL MAN AND VITAL STATISTICS.

By Medical Director J. D. GATEWOOD, United States Navy.

Man has always been a thinker as well as a fighter. During his long career he has had thoughts without number and apparently on all subjects, if it be true in general that "there is nothing new under the sun."

If one looks through the incomplete record man has managed to make and preserve, it certainly seems that, while always living in error and actuated by vanity, even at times to the extent of believing that the sun, moon, and stars have been created solely for his benefit, he has found no subject too difficult or profound to form at some time a basis for his dreams—for the framework of his ideals.

In view of such a history, and in spite of the fall of many cherished conceptions, it seems remarkable that the vanity of the human race is always sufficient to cause it not only to laud the present at the expense of the past, but also to view the past as something apart to be ridiculed for its errors and utilized more to feed the vanity of a present generation than to teach it humility and the lesson that pride comes before the fall—pride in the very things that have time after time caused the fall of individuals and of nations.

Is it really true that "a little learning is a dangerous thing?" If so, the present is surely a dangerous period, for probably at no time has a little learning been more widely diffused, more completely organized, and, in general, placed so advantageously for dangerous expression. It is true that public education has a deep significance, representing an appreciation of knowledge by which man intends to raise the level of his existence and to render impossible those situations or conditions in which he has suffered through unreasonable domination. Public education is the method of democracy and, as such, is the basis of attempt to be unlike "dumb driven cattle." And the reasoning is surely correct, though serious fault may be found with methods, for they do not inculcate humility, which is the student's first essential; and they do give a smattering of many things with often no satisfactory knowledge of anything, thus leading to increased vanity, to a disease characterized by a form of blindness.

Yet, it is true that, as opportunities are increased, the relative number of the well-informed increase, but even then there is a period of doubt as old traditions are cast aside and well-grounded beliefs are delayed. Experience shows that an age of reason, as man understands that expression, is not necessarily an age of character. A little leaven may leaven the whole loaf, but sour bread is not uncommon.

There were times when man was proud of individual prowess in arms, when the wearer of the sword looked with contempt upon the wearer of the apron and the carrier of the measuring rod or yardstick. It was then a time of danger to human life through individuals' brawls.

To-day the average man takes pride in his knowledge of all sorts of things. He often studies metaphysics and sociology, law or medicine, before he has a good working knowledge of the three "R's," and prides himself upon emancipation from the thralldom of ignorance so common in other ages. So many know how to read who do not know how to think, and yet pride themselves upon knowledge of as many subjects as are formulated in quiz compends and between other small covers. It is astonishing how very many speak in a knowing manner of the knowledge of to-day with little knowledge of any subject.

Such men necessarily fail to recognize that there are as many small minds as ever, and as many who should be rightly led, but who, on account of their vanity based upon a smattering of many things, are more amenable than ever to the influences of the shifting quack or demagogue, and more dangerous than ever because nothing is regarded as too complex or subtle for their consideration, determination, and action. It is possible for the superficial knowledge, or rather learning, of the many to be more dangerous than was the sword in other times, for man can wear the sword in any age.

The facts seem to be that each age has certain characteristics of its own. One sometimes wonders whether man's brain is more or less like a quart cup in having a fixed capacity. At any rate, he often seems to advance far along certain lines at a time when he is losing appreciation of much that is important, or even essential, along others. He seems at times to be dazzled by his own vanity. One man thinks he is a better man than another because he has wealth, or because he has more knowledge than another about those manifestations of ingenuity which he considers constitute or mark our advanced civilization. He has then lost appreciation of the facts that neither money nor knowledge is character, that civilization is within and not without, and that to go about thinking that one is really better than all others is a manifestation of a form of blindness. It is a blindness more common in youth, but not confined to any age.

Now, this age is characterized by what is called advanced thought, which very frequently means thought that has commercial value or practical application in improving, or rather agreeably altering man's material environment. We speak of this epoch as the golden age of science. This is true in more senses than one, for scientific advances are frequently employed to increase material possessions, the value of a thought being most often measured by its money-getting power. The man who makes a fortune from the invention of a toy takes himself more seriously than if he had discovered a law of the universe, and his children will consider him and themselves more seriously. Indeed, the man who improved the pencil sharpener has been a more useful member of the race than if he had discovered the Martian canals. In fact, one man is in a practical sense better than another if in a given place he can do the required work better than the other. And the practice of medicine does not differ in that respect from the practice of other things, while mistakes may cost more when measured by other standard than dollars and cents.

Yes, this is a practical age. He who can best employ agents or appliances to do desirable or necessary work is the most efficient man, and he who maintains possession of the greatest wealth as represented by money, is regarded as the most successful man. Everything is relative. Men voluntarily pay for what they think they are getting, but very often pay for things they did not expect to get.

If everything is relative, the assumed value of anything depends upon the standard. Throughout history man's weakness or strength has been declared in the quality of his standards. To the materialist the value of the dying man can not exceed the value of his body. He is not a good man because he is no longer efficient. He is a good subject if he has some obscure disease or condition in the clearing of which his body may be a good witness. Yet, many unprincipled men have been good practical men, so far as the doing of specified work is concerned, and not a few have won battles or died as heroes. It is all a question of standards.

As a practical age this is a coordinating or a consolidating age. It is beginning to be thought that each man is part of a huge social machine that should be made to work efficiently as a whole, each individual being a mechanism, not of man's devising, and all mechanisms, recognizing their interdependence, doing the work necessary for the best output of the whole machine which is thus vitally interested in the integrity or good of each of its living parts. Thus, in the State each part would be required to be a good citizen that the State itself might be good or desirable.

Such an idea may never find full expression in practical form, but sufficient has already been accomplished to show the great value of co-operation. And it is, after all, a mere division of labor such as is

found everywhere in the human body itself, which, growing from a single cell, secures its physiological activity by a differentiation of cells into varying tissues. Yet, there are certain parts of the body, having unknown function and regarded as mere appendages, which may become diseased, or so swollen and disorganized as to threaten integrity or even cause death. History shows that the same is true of the body politic. But an abnormally puffed condition of any organ, however important it may be, is a sign of loss of efficiency and possibly of loss of integrity. In the social machine the heads of the various mechanisms seem to present this condition more frequently than other parts, and, in this golden age, the disease may be associated with formation of scale due to auriferous deposits.

Now, the medical profession is one of the great divisions of the social machine. Its function is quite remarkable in its relation to the machine as a whole, inasmuch as it is concerned with the preservation, promotion, and improvement of the health and the prevention of disease in each of the mechanisms going to form the machine as a whole. It aims to acquire and apply knowledge necessary to avoid breakdowns in the individual human machines—machines not of man's devising and having certain qualities beyond the ken of the mere materialist.

In view of the important functions of the medical profession, a division of the great social machine, its tremendous amount of lost motion is noteworthy. It is made up of those considered to be specially educated to perform the functions enumerated above. Yet, with them, as with others, too many have sought the higher education without being conversant with the lower. The result is that, while other divisions of the social machine, made up of the specially educated, claim to be not only demanding higher requirements, but also seeking to improve and increase their output by coordination, the medical profession of this country is now lagging in both respects because it is just awakening to its opportunities in that regard and is only beginning in a practical sense to be aware of the causes of the inefficiency of too many of its members. And it does seem lamentable that the vanity, engendered by a smattering of the many things too often crowded into primary courses, should lead many to undertake the acquisition of the medical knowledge so many commercial schools dispense without regard for the fact that they are trying to build upon inadequate foundation. Indeed, such schools too often claim by medical diplomas to have sufficiently instructed those who, during their entire time in primary schools, have demonstrated their inability to receive even an ordinary elementary education.

The result is necessarily a profession made up not only of the brilliant as well as useful, but also of the ill trained and unworthy, who

constitute a percentage too large for the profession as a whole to assimilate. It would surely seem that Abraham Flexner has recently done a very great service in bringing out this essential defect, and one fails to see how the medical profession of this country can continue to permit itself to be at such a disadvantage as he has portrayed in his report on "Medical Education in the United States and Canada."

This situation arises in an age in which there has been a marked increase in those varieties of investigation that may be designated as the exact, and no one can deny that certain branches of medicine have made very noteworthy advances along just such lines.

All sciences are struggling to be exact sciences, and this is so much the spirit of the time that the scientists regard themselves as the world's elect. Some men take pride in family and breeding, and others in money and power, but the scientist, especially if only a follower within his profession, is too apt to reflect the spirit of the time in a display of thought of superiority of mind that is often as marked as the arrogance of excessive money or substantial possessions.

It is often asked with some bewilderment why the average scientific worker takes himself so seriously and regards himself and his co-workers as forming such an exclusive body. However, it appears that such persons believe they are above others in that quality of mind represented by ability to think correctly—to understand what constitutes proof, and to arrive at conclusions by the recognized methods of proof. They seem to base that opinion more upon a fundamental appreciation of mathematical methods than upon anything else. They consider that their education has been essentially along mathematical lines and that it is only along such lines one can develop a mind capable of understanding the science of correct and accurate thinking. They all believe, for instance, that geometry is the purest form of logic; that the kind of mind unable to appreciate proof of that character is necessarily lacking in a quality that is the essential basis of a scientific education, and that, therefore, inability to cross the *pons asinorum* at least represents inability to take up any profession requiring logical methods of thinking.

In this contention it does not appear the claim is made that lawyers and doctors must be mathematicians, or even that a mathematician would make the greatest success in the study of law or medicine. A mathematician is one versed in mathematics—one whose specialty is mathematics. A knowledge of what constitutes proof in a mathematical sense does not declare a mathematician. A man who takes a drink need not be a drunkard, one who plays cards to while away an hour is not a gambler even if he includes a stake, and one who appreciates logic as a mathematical subject need not be a mathematician. The scientist does not claim that mathematics is all that is

required in a preliminary education, but merely that unless one can appreciate mathematical methods he can never become a scientist, including the science of medicine with other sciences; he can never be trusted to keep on the trail that leads by tortuous ways to knowledge; he can not be expected to prove his own work or to understand the proof of another's work.

Science, therefore, argues that unless one has a good preliminary education, constituted largely of the sciences, one is not fit to take up any of the professions, and that as each scientist must not only have had such an education, but also must have continued to develop his mind along the line of work that results in knowledge gained and verified by exact observation and correct thinking, he should exclude from the inner circle those who, lacking in scientific attainments, have tended so frequently to put forward fads and fancies as facts.

It is probably just here that the large number of uneducated men in our profession place us more or less out of joint with the times, and it is undoubtedly true that, however much routine information one may have picked up and however great may be the mechanical skill one has acquired, the time has passed for dogmatic assertions, even in medicine, and the time has come when our knowledge as a profession must be based upon a satisfactory general education. In no other way can we ourselves become less like sheep following leaders, less like the many having a smattering of many things. In no other way can we be capable of recognizing and utilizing satisfactory professional standards, by which the fads may be separated from the facts. It is true our leaders are frequently giving us much-desired advice and information and perhaps, chiefly from abroad, are making the advances of which we are all so justly proud. Yet too often so-called advances have not only ended in disappointment, but also have even held the profession in their sway for many years, during which there has been loss of prestige and of lives.

There is an interesting idea just here that under other circumstances would be well worth expression. A medical man should be first of all a desirable citizen. By virtue of his calling his responsibilities as a citizen are greatly increased. He can not afford, and has not the inclination or the time, to be a politician, who is too often more of an echo of a class than a molder of public opinion; but he should be capable not only of analyzing the principal public questions of the day, but also of recognizing his duty in the preservation of the health of the State. In recent years publicity has been increased very greatly, and even medical news finds its way into the public press. Every medical man should be capable of discussing questions of the public health with any well-educated citizen and in doing his part in forming public opinion in that relation if in no

other. Yet, while good government depends upon wise laws properly administered, the record shows that legislation for the preservation of health has been generally years behind the times and that often the medical mind lends itself to mistaken ideas and to impracticable schemes. A well-educated and a good man can be very useful at a period when the diffusion of a little learning causes the value of good influences to be at a premium.

In science one is taught not to speak before one knows, while in literature one is merely cautioned not to express oneself before one thinks. According to a celebrated author, literature is merely a modification of ideal things, while science is knowledge of things. If that is applied to medical works, the science of medicine appears to be much curtailed. Who is willing to trust to a Practice of Medicine or a Therapeutics even a few years old? It is true there have been many additions of recent information, and that is likewise true of the various branches of science, but with us new discoveries so completely overturn former beliefs that we have to recognize that the works of the past are more literary than scientific in character, as they were the result of thought rather than the expression of knowledge. And when our beliefs are overturned we can not show that our calculations were wrong. Too often we have followed our leaders like so many sheep, and, while bolstering our positions with learned talk, have eventually abandoned them with no other excuse than can be given for any fad. And all these things are remembered against us.

We can not expect an appreciation by outsiders of the difficult life problems always confronting us; but one can expect in this age an appreciation of our methods. Therefore, the scientific mind can not understand why we are so negligent in gathering data. Science is knowledge gained and verified by exact observations. In every science results are recorded in a most painstaking way. In physics and chemistry work is regarded as a dream unless associated with notes. It is constantly recorded that under certain conditions certain results follow, until not only facts but, under the scientific mind, reasons for them are evolved, and upon those facts and reasons other facts and reasons are imposed.

But with us, while isolated records have been more or less common, combined records have been lacking, and ordinarily a consensus of opinion has been evolved from a final recognition of long-continued error. We took up bleeding and pushed it to the limit and in the most routine way for years. We thought we were doing good, but some very strong words have been used in relation to good intentions. The fact is, we continued in the wrong path so long, because we had no compass—no reasonable standard. We had neither mortality rates for the diseases we were treating nor, in many cases, the time required for recovery without interference. We had not collected the neces-

sary data, and we have not yet made that collection in a degree that is at all satisfying. We have been satisfied with the general truth that all must die, and we seem for so many years to have assumed that, as sickness ends in death, each case naturally tends to terminate in that way. Therefore, we seem to have thought that each recovery was the result of treatment or medication. We might just as well have believed that, since nearly all men die in bed, either the position in bed caused death, or few would die if beds were abolished. At any rate, so erroneous were our conclusions in regard to medication that now it is too common for teachers to inculcate the belief that the most successful practitioner is he who most skilfully avoids the use of drugs. It is rather startling to think of a teacher of *materia medica* practically arguing for the abolition of *materia medica*.

And to the scientific mind how can we, who drift from one extreme to another, explain these things? We would be offering explanations to those who are always gathering data and tabulating results and who recognize that we have not only always been negligent in that respect, but also too inexact in our methods to appreciate the necessity for the only course that would enable us by comparison to arrive at a just estimate of the value of our professional efforts.

The recent advances credited to the medical profession cause one to be chary of criticizing. Everyone knows that the medical profession contains many of the most profound and alert minds, and very probably has always contained them. But recently they have been under the influence of a scientific age, coming into their work in accord with the requirements of the times, seeking to standardize, and utilizing methods employed and advances made in such scientific branches as physics and chemistry. In the laboratory, whether chemical, physiological, or bacteriological, knowledge is gained and verified by exact observation and correct thinking. It is even noteworthy that the latest addition to *materia medica* has a mathematical designation, having been evolved by systematic substitutions and eliminations. Yet, it is also worthy of note that there was recognition in this case of the tendency of the profession at large to accept and popularize individual proclamations that have been so often assumed without proof to state facts. It was, in great part, this fear, this desire to prevent the many from acting as so many sheep following a leader, that caused the material for which so much is claimed to be placed first in independent hands for verification of claims. This caution has had a powerful influence in an educational way, leading to trials everywhere rather than to a blind acceptance.

It certainly seems strange that, since science came to the front, the one educated individual considered to be the most completely oblivious to the advantages of mathematics has been the doctor. It has even been thought that the medical mind is so different from other

minds that it shies at any piece of white paper marked with mathematical signs and symbols. While there is a considerable number of our profession to which this certainly does not apply, it has seemed true of a sufficient number to give rise to a reputation that clings to the whole. Therefore, those who believe that science is knowledge gained and verified by exact observation and correct thinking, look with doubt upon the scientific claims of men whose minds have seemed to be constitutionally averse to the acquisition of the exact methods so generally sought to be inculcated in early life.

Besides, the physicist knows that every branch of mathematics has to be extensively utilized in the study of physics, and that if that study be divorced from mathematics only a smattering results. The chemist, too, is always working with symbols, formulæ, equations, and decimal points. He also recognizes that his subject is in very close touch with physics and that mathematics, with its process of reasoning, is becoming each year more intimately associated with progress in his work. And every chemist, who has tried it, knows how difficult it is to teach chemistry to a class of medical students. Yet, it may be at least doubted whether physiology or therapeutics or certain other important branches of medicine can be divorced with success from either physics or chemistry. Each medical student studies chemistry, but relatively few seem able to give much attention to it, much less to physics.

Perhaps most medical men believe they belong to the body of scientists. Nothing could be further from the truth in the estimation of the men who pride themselves on their scientific attainments. It is said we have not been collectors of data, we have not recorded a sufficient number of results, we get up isolated statistics and draw conclusions without means of comparison, our experiments are too often unrelated, our work too disconnected, we are lacking in order and system, we do not even agree upon the names of the diseases we study, we have continued for many years to be experimenters but too many of our experiments are wasted and most of our efforts lacking in general value because our records are restricted, limited, and lacking in uniformity and system. Some medical man reports 50 or 200 cases of a certain kind and the whole profession bases its opinion upon the results, when there may be 100,000 of such cases each year of which, as a profession, we know nothing. The Government, and even some commercial houses, can tell how many pounds of wool or bushels of wheat were raised in the United States last year, but who knows how many human beings died of typhoid fever, or pneumonia, much less how many cases of each there were. To-morrow there may arise some new treatment or some new drug extensively utilized in the treatment of those diseases—some treatment to which the profession may lend itself as readily as it did to bleeding—but, if it is not

actually specific and without important side actions, through what vicissitudes must it pass before its true position is determined? Too often the value of a drug has declined from 25 cents an ounce to 25 cents a pound to accord with change in fashion or popularity. Then, too, we claim that the highest function of the doctor is the prevention of disease, but how can we measure the value of prophylactic measures if we do not know the incidence of disease?

Those are some of the things said about us, and there seems to be no satisfactory reason why so much more pains should be taken to secure commercial statistics than vital statistics. One asks whether money is of so much more importance than life and whether it is reasonable to have a tariff board for the collection of certain data in detail and yet remain in ignorance of even the movement of diseases that rob every home. One of the boasts of our civilization is the security of life from intentional violence other than war, but how small has ever been the loss of life from that cause when compared with that from the ravages of disease! And, apart from mortality, can we not think of the very large number of suffering ineffectives who make the daily sick list of the Nation? Who knows what is the percentage of sick of this Nation, to what extent each disease is represented, the average time each of those diseases incapacitates, the loss of earning power each disease necessitates, the extent to which each period of life is represented, the conditions of surroundings or the habits of life under which each disease increases or wanes, the relation of the health of the masses in the industries of the country to the greed of the few, the relation of ill health to the lack of education in subjects relating to the prevention of disease? These questions might be continued for a number of pages.

Of course we can not give even approximate answers to any of those queries, and it is quite evident that time and money would have to be expended to secure such answers. Yet from a considerable area of the United States the Bureau of the Census obtains limited information of a number of diseases, and that registration area has been extending. However, there has been difficulty not only in relation to registration but also in securing uniformity even in the limited nomenclature of causes of death. It is quite evident that as a profession we have not yet taken the full step which only we can take and without which no other satisfactory step can be taken toward collection of the data we must have before we can know what, as medical men, we have to accomplish, much less what we are accomplishing. That step is to agree upon the names, the designations, of the very diseases we are always considering. We must have a fixed nomenclature of diseases or it will ever be impracticable to obtain specific and trustworthy statistical data about them.

Now, from application of the scientific methods of the laboratory, there has been evolved a growing and more or less exact knowledge of the causes of a number of most important or damaging diseases, and of practicable methods of prevention. As a result of such knowledge, the interest in questions of public health has greatly increased and has manifested itself prominently in the enlarged functions of local and State boards of health, and of the Public Health and Marine-Hospital Service. In many medical societies and associations consideration of such questions has come to occupy an important place, and, throughout the land, not only the medical profession, but also the people are awakening to the national as well as local value of knowledge of how diseases are spread and of the degree of damage each preventable disease inflicts. Interwoven with such an advance in public education is a growing appreciation of the interdependence of different States in matters of health. Given belief in communicable disease and knowledge of the rapid and extensive travel of persons throughout the United States, it follows that the health of one State influences in no small degree the health of all others. In fact in these days it is appreciated that the health of any one country has relation to the health of all others. And so, extending from the hamlet, the question of public health broadens to include the Nation and the nations. It becomes national and international. As vital statistics are the results obtained by the application of mathematics to health records, they are coextensive with disease itself, being ultimately national and international.

As a mathematical subject, vital statistics do not seem to appeal to the medical mind. Such data seem to be regarded with an uncomprehending eye, or with considerable doubt, or as having insufficient value to pay for the trouble required to collect them. Yet, if we as a profession had the scientific spirit well distributed among us, we would recognize the meaning of the intense interest all scientific bodies take in the collection of data relating to their work. In every direction there are so many unknown things that no scientific body can afford to cease to collect all that can be determined in relation to a subject worth consideration. The principle of such action is declared in every algebraic equation, where from known quantities and relations the value of the unknown is determined. The astronomer would be lost without the accumulated data it has required years and endless labor to collect. From such data he comes to conclusions with great accuracy. The ephemeris itself, upon which all navigators depend, is nothing more than a collection of tables or data showing the positions of heavenly bodies accurately calculated long in advance. In all scientific circles there is a constant struggle for more data, and it seems remarkable that the medical profession does not appear to

recognize that vital statistics represent an analysis which is necessarily at the very foundation of all inquiry of sanitary conditions and sanitary progress.

We can not be considered to have even begun to gather satisfactory vital statistics, and, doubtless, after we do begin there will be a period when the data will be too incomplete for definite conclusions, and yet such conclusions will be attempted. It is such attempts that discredit statistics. A thermometer would be untrustworthy if its scale were not adjusted with more or less accuracy, yet, if it had no scale at all, one should be able to recognize the importance of the principle involved and how the instrument could be completed to the great benefit of mankind. Incomplete things are always more or less misleading if one insists upon using them as if they were complete. And the same is true of statistics.

There is only a step from the ridiculous to the sublime, and very often there is only one step from inefficiency to efficiency. Little things count for so much at times that they make the most astounding difference in results. And, after all, satisfactory statistics result from the gathering of an enormous number of numerical items—very small things as a rule—and classifying them in every logical way in order that relations may be disclosed and studied.

As an illustration of the astounding difference little things can make in results, the following may be considered: Given a sphere or ball the size of the earth, say all great circles about 25,000 miles in circumference, and a metal band on the circumference of one of its great circles, such as the equator, and accurately fitting it, what difference in the fit would result if the band were cut and a piece $12\frac{1}{2}$ inches long inserted, uniformly increasing the size of the ring? At first sight many would say that $12\frac{1}{2}$ inches added to 25,000 miles would make an inappreciable difference, but it can be readily shown that, as $12\frac{1}{2}$ inches added to any circumference increases the diameter about 4 inches and, consequently, the radius 2 inches, the same would necessarily be the result in this case and, therefore, the band, thus enlarged, would stand off from the ball 2 inches all the way around.

Most people believe they have a full appreciation of the advantages and disadvantages of little things, and certainly that belief is very ancient. Hesiod, who flourished 800 or 900 years B. C., wrote: "For if thou addest little to little, and doest so often, soon it will become a great heap to him who gathers." Each man who has had a cinder in his eye, or has had to look for the flea in his most intimate possessions, knows the disadvantages of little things and the consequent advantage of having even little things in their proper places. But, while it is the little things that together make the great things, many of us are trying to attain the great without the labor of putting together the little. We know that every building, and

vital statistics may be considered analogous, is made by adding brick to brick, or stone to stone, or piece to piece, or item to item, yet we are apt to be so impressed by completed structures that we forget the planning, the material, and the labor required in the building of them. Then, too, given the bricks or stones, any number of structures, varying in size, design, beauty, and usefulness can be made, although it may be well to recall that no building perfectly adapted to requirements has ever been constructed.

It is to a certain extent the same way with vital statistics. The numerical items, as the material, are essential, and a very large number of them. However, with those at hand, the statistician has not the same power over them that the architect has over his material, although he should have, and it is believed will have as the data, with derived knowledge, increases. The architect already knows his material and the relation one kind of material bears to another. That is part of his data carefully accumulated by many workers or investigators. Unfortunately, the statistician in our profession knows some relations only, and often has to depend upon some very simple relations for a start in the erection of structures of which the designs are always very incomplete. He is greatly handicapped by lack of data, as his important subject is in its infancy. Without nomenclature and without classification he can do nothing. The nomenclature must be his fixed point of departure—a known quantity in his equation.

The builder must know how much of each kind of material he requires to carry out a given set of specifications. The statistician must know at least how much of each kind of material he has. In each case nothing can be done without exact designations. There are varieties of brick and also varieties of fever, but each variety must be clearly indicated in building any complicated structure in which all are used. That seems to be self-evident, but we, as a profession, do not seem to recognize its importance. We call the same disease by different names or even different diseases by the same name, and then by mixing wood, brick, stone, and mortar, as it were, we make it impossible to attempt to build any of the structures that would in their building demonstrate relations now unknown. Every branch of science covets and eagerly seeks knowledge of just such relations. In fact, science is largely a study of relations and is knowledge coordinately arranged and systematized. It is by studying relations, by trying to build, that additional or unknown relations are disclosed. As in designing buildings, need of special material, such as bricks or stone of special shape, is declared, so, in trying to build with material of known relations, new requirements are declared and new relations established. It is from premises that one draws conclusions. It is from known facts that one deduces facts formerly unknown.

The questions of nomenclature and classification of diseases remind one here of algebraic equations. In such equations there are known and unknown quantities, and each equation is formed to agree with declared relations between them; in fact, each equation merely represents those relations, and it is from those relations and the known quantities that the values of the unknown quantities are determined. Now, millions of equations can be made, but each one must exactly declare the relations stated in the problem, the solution of which it was formed to secure. And those relations are between the known and the unknown. Known quantities are either directly or, as in the application of formulæ, ultimately made up of figures—one or more of 10 digits.

So it is with vital statistics. They can be and should be arranged in very many different ways, each arrangement declaring those special relations required in the solution of a stated problem, but, as in any equation, those relations must be between known and unknown for the purpose of finding the value of the latter. Now, the known quantities are necessarily numerical items, often fundamentally designating cases of or damage from a known or given disease. Just as in an algebraic equation, 95 may represent inches, or gallons, or horses, or cows, or men, or houses, or anything else required by the problem, so in vital statistics the same number may represent cases of typhoid fever, typhus fever, measles, mumps, pneumonic fever, or cholera, or anything else, such as deaths from any one of those diseases, for instance. But, in each case the number must have some known connection; it must be fixed in its application as well as true in the number of its units. Cholera must not be mixed with cholera morbus, or with anything else; typhoid fever with typhus fever, either directly or through a mixture of abdominal typhus and exanthematic typhus; pneumonic fever with broncho-pneumonia or through a mixture of lobar pneumonia and catarrhal pneumonia. In all applied mathematics a fixed nomenclature or standards are required, such as pound, yard, meter, foot candle, calorie, ohm, and the like. Is it not equally apparent that, in the application of mathematics to health histories, we must have a fixed nomenclature of diseases? Must we not have known quantities if we are to find the value of the unknown?

But, given such known quantities, why should we quibble over classification? It is bad enough, in our attempt to form a nomenclature, to accept malaria without much murmuring and then get into a heated discussion over the propriety of neurosis. It would not make so much difference as some suppose if we called typhoid fever the "A" disease and malarial fever the "B" disease, provided each member of the profession invariably utilized those designations. Malaria is as far from truly representing that disease as it well could

be, but if we all knew how to employ the word in its accepted designation and invariably so used it, it is an exact term for practical purposes. Any other idea is one mistaking form for substance. We might call malaria "anopheles fever," and yellow fever "stegomyia fever," as has been suggested, but the essential point is for each one to call each disease by the same name and for that disease to appear invariably in vital statistics under the one name. We can go on quibbling until doomsday over the names of diseases, but the fact is that the meaning, as well as the pronunciation of words is purely a matter of custom or good usage. Not one man in a thousand knows the derivation of the words he uses with exactness and, as a matter of fact, many of them are of uncertain origin and many have meanings entirely different from the words from which they were derived.

But classification is something very different from nomenclature. Classification expresses relation of some kind and, as relations differ in each problem, so classification varies in accordance with requirements. A classification to meet the requirements of a naval service is not suitable or practicable at this time for a civil community. Numberless classifications can be made and should be made, each in accord with special requirement, each analogous to the relation between the known and unknown in an algebraic equation. Each problem must be solved in accordance with its own conditions, its own specific relations. Given a complete and fixed list of diseases and injuries, it can be applied to mines, quarries, railroads, machine shops, jails, almshouses, lighthouses, ships, hospitals, navies, armies, civil life in general, or industrial life in general or in detail. In those applications the list of diseases will be arranged in varying classes to accord with special requirements.

A lack of appreciation of this situation has led to some interesting results in attempts made to form a rigid classification of diseases for general use. Such a result can be observed in the last nomenclature of diseases agreed upon by the international commission charged with the decennial revision of the International Nosological Nomenclature. This is the Bertillon nomenclature as modified in Paris during three days in July, 1909.

That is a very important document from several points of view, which, however, do not seem to prominently include actual intrinsic merit even as a nomenclature of diseases, much less as a classification. Its main distinctions are its show of authority through which a very valuable degree of uniformity is obtained, its renewed exhibition of method or route by which international uniformity in a satisfactory complete nomenclature may be obtained ultimately, and its strong suggestion, in the influence it has exerted in this country, that the profession here would welcome some comprehensive authoritative

work putting a nomenclature of diseases on the same authoritative footing as our pharmacopœia.

In passing, it should be noted that the absence of an international pharmacopœia is another indication of our lack of professional co-ordination. Such a pharmacopœia would represent a great advance toward the kind of international exchange of thought each branch of the sciences eagerly seeks. Too generally must medical works of foreign origin be laboriously interpreted, especially their therapeutics in relation to *materia medica*, however familiar one may be with the national tongue in which they are expressed. Science has a very valuable degree of uniformity in its technical terms, but while scientists talk familiarly in such terms we deny ourselves the corresponding advantages to be derived from like knowledge of the materials we employ, although we use in our pharmacopœia the Latin, which suggests a general application that does not exist. This relates prominently to standards and preparations from crude drugs.

Now, perhaps the most available internal authoritative source from which the medical profession of this country looks for a standard nomenclature of diseases is the American Medical Association, which has a standing committee on nomenclature. Yet the American Medical Association in June, 1908, resolved that the International Classification of Diseases and Causes of Death be recommended for all official mortality and morbidity statistical reports. That association will probably never find it advisable to rescind that resolution, but it will doubtless modify its scope at some time by putting forth a nomenclature with perhaps nothing more than a declared tentative classification, each official source being left to select the classification most advisable for its purpose. The nomenclature itself will hold to the International Nosological Nomenclature by "numbers," but will be so expanded as to be really suitable "for all official mortality and morbidity statistical reports." This is expected, because it seems to many that no other course has the merit that insures success.

It is noticeable that very soon after the International Nosological Nomenclature of 1909 was promulgated the Bureau of the Census was reporting as follows:

It is neither a complete nomenclature of diseases, like the Nomenclature of the Royal College of Physicians of London, which provides a complete list of definite terms and accepted synonyms for the naming of all diseases, nor a scientific classification of diseases in the sense of presenting a logical arrangement of morbid conditions. It is nothing more or less than a list of statistical titles, under which individual terms designating diseases or morbid conditions as reported by physicians may be more or less satisfactorily grouped for statistical purposes.

Yet, it is quite clear that some kind of classification is made in the International Nomenclature and that, therefore, it has not the form

of a mere list of statistical titles. It certainly shows an attempt to make a more or less logical arrangement of morbid conditions, but unfortunately the arrangement is not sufficiently consistent for general acceptance, except under the pressure of authority or the desire for uniformity. A number of examples might be cited, but the following may suffice: Soft chancre in the sense of chancroid is classed as a general disease, but pneumonia is excluded from the list of "General diseases" and placed under "Diseases of the respiratory system." Benign tumors, such as lipoma, are classed under "General diseases," but cerebrospinal fever is denied its place under "General diseases," and thus also excluded from the epidemic diseases, being classed under "Diseases of the nervous system and of the organs of special sense." Under the agreement that typhoid fever is a general disease, one naturally asks whether it is not just as much a disease of the digestive system as pneumonia is of the respiratory system or cerebrospinal fever is of the nervous system.

As a matter of fact, there are about 210 designations of diseases, injuries, and titles in this nomenclature, arranged in 14 classes, one-half of which are anatomical. The grouping of local diseases in accordance with the anatomical systems or apparatuses affected is apparently one of the logical methods of classification for ordinary use, but, in making such a classification, it is important not to lose sight of its purpose by uniting important systems or apparatuses in one heading. For instance, in the classification under discussion, class II is designated "Diseases of the nervous system and of the organs of special sense," while, under that heading, "Diseases of the ears" appears merely as a title, or as if it were the designation of a single disease, and, after specifying only two diseases of the visual apparatus (follicular conjunctivitis and trachoma), "Other diseases of the eyes and their annexa" appears as the title under which all other diseases of the visual apparatus are to be returned.

It is interesting to note that the Bureau of the Census regards this nomenclature as furnishing, in the manner indicated, a list of statistical titles under which individual terms, designating diseases or morbid conditions as reported by physicians, may be more or less satisfactorily grouped for statistical purposes. All that may be true enough from the present point of view of the Bureau of the Census, but from a medical point of view too much is left undetermined, and the medical profession is too much interested in diseases of the auditory apparatus and of the visual apparatus to be satisfied with a nomenclature that secures no uniformity in the designations of such diseases, evading the issue by returning practically all of those diseases as merely part of a class.

However, the Bureau of the Census has had too much difficulty in securing uniformity in reports of causes of death not to see and pro-

mulgate the advantages of a nomenclature very influential in that direction. The medical profession should also gladly recognize the great advantages accruing from such uniformity and lend its full influence to rapidly increase the area from which the census receives returns. Nevertheless, in the study of that nomenclature, it can regret that the idea of morbidity statistics was unfortunately very greatly subordinated to the census requirement for mortality statistics—so greatly subordinated that the table, put forward as especially applicable to statistics of civil and military hospitals and other institutions which record both diseases and deaths, can not be regarded as satisfactory for that purpose. This might be shown in a number of directions, but a few instances may suffice. Measles appears in the table because it is a recognized cause of death, but the disease known as mumps, or epidemic parotitis, has no special designation, but is merely required to be included in "Other epidemic diseases." Yet, the naval service receives as much damage from mumps as from measles, and consequently is as much interested in its incidence and prevention; and it is also interested in dengue, for which no special provision is made in the nomenclature. "Gonococcus infection" appears well enough as a cause of death, but, in a nomenclature intended for morbidity statistics, the expression is too general. It is designated to include gonorrheal rheumatism, ophthalmia, adenitis, and orchitis, as well as gonorrhea. A naval service is interested, for instance, in the number of cases of gonorrheal rheumatism in relation to number of cases of gonorrhea, and is also as much interested in tracing disability results as fatal results. The same kind of remarks might be made in relation to such titles as "Diseases of the ear," in which, for instance, rupture of the tympanum from gun concussion should not be included.

Of course, it has been said that all such titles can be expanded. That is true enough, but it is also true that any medical man can construct some kind of nomenclature and some kind of classification. What is needed is uniformity in a completed nomenclature, as much uniformity in morbidity statistics as in mortality statistics. Therefore, the inclusion of a whole class of diseases under one commonly-used title, with the recommendation that the medical man be allowed to designate as he pleases the individual diseases under that class, merely prolongs confusion.

Perhaps the proper way to look at this International Nosological Nomenclature is to regard it as the best that could be accomplished amid conflicting ideas and differences in language, and, at the same time, as a long step in the right direction. Its educational value is very great and its actual value should be appreciated highly, inasmuch as it can be used to secure uniformity in returns of causes of death and to form a very valuable basis for a satisfactory nomencla-

ture. No one who has never tried to construct a nomenclature of diseases can appreciate the difficulties involved. That is true, whether or not it be also true that a satisfactory morbidity table may not be secured from sources dominated by a census idea concentrated upon the causes of death. Yet, the desire for a satisfactory morbidity table represents the broader view and includes causes of death.

As it is true that the desire is for international as well as national uniformity, no country can afford to lose the degree of uniformity secured by the international commission or to fail to lend support at each decennial revision. But, holding the numbers designating the titles and recognizing each disease so designated, it seems quite practicable, and even very desirable, for this country, or the English-speaking countries, to construct a nomenclature first in Latin-English and then in English-Latin, each arranged primarily in alphabetical order, and perhaps finally in some nosological manner, with alphabetical arrangement under each heading, after the manner of the pharmacopœia. There would thus be four tables or arrangements, each a list of the same diseases and each disease having the same number. Following those tables there would be an explanation of each designation, such as appears with the International Nosological Nomenclature, showing synonyms and giving conditions which should be considered merely as complications; and an index, after the manner of the International Nomenclature, by which any synonym can be immediately referred to the designation chosen for statistical use. The total result would thus agree with the International Nosological Nomenclature in all respects necessary to secure the degree of uniformity it provides. It would be that nomenclature expanded to satisfy the requirements of services recording in detail both diseases and deaths.

The nosological feature is not essential, but helpful. As has been shown, such an arrangement is necessarily varied to meet requirements, but any one logical arrangement has a strong educational influence from certain points of view, stimulating study of the relations of diseases, suggesting application of such knowledge to different classifications, and thus facilitating research and reference, especially from a sanitary point of view. It has been well said that "groups of diseases, coordinated upon a theoretical basis, are becoming of less and less practical value." Nevertheless, it is equally true that groups of preventable diseases, coordinated in such way as to show in statistical returns their relative importance in relation to prophylactic measures, are becoming of more and more practical value.

For several reasons Latin is advanced as having place in an international nomenclature. It has been said that it is "the modern trend of medicine to make Latin its servant in place of its old-time

master." It is suggested in an international nomenclature as a servant to help in securing international uniformity. Besides, in using the lists proposed no knowledge of Latin is required, but merely the exercise of just that amount of memory now employed in using any technical terms. The large majority of medical terms are of Greek or Latin origin, and many of them require no change, while others require little change, to give them a place in a Latin nomenclature. If one can remember tonsillitis or amygdalitis, he can as readily employ pleuritis or catarrhus or febris. The profession should seek standards, and with a fixed international Latin nomenclature one would avoid the wrong conclusions often necessarily drawn from translations made by using a polyglot lexicon. In other words, Latin furnishes the means by which an international standard nomenclature might be secured. The scientific trend of the age is to standardize. Latin is certainly the language that lends itself to an international alphabetical arrangement, and the argument for the use of Latin in our pharmacopœia is even stronger when applied to a nomenclature of diseases for international use.

Given a fixed nomenclature, institutions and services of like character would have to agree upon their special classifications required to secure uniformity in the attempt to solve their special problems. The Bellevue Hospital Nomenclature of Diseases and Conditions represents a noteworthy attempt at classification suitable for a hospital. That classification was made without the aid of a recognized standard nomenclature, but, as a classification, its merit is such that it is used with satisfaction in a large number of hospitals. With a standard nomenclature a uniform classification should be evolved for use in all civil hospitals.

Navies and armies have problems of their own which necessitate special classifications, but with a standard nomenclature all such classifications could be readily converted or rearranged to meet all census or international requirements. In fact, the nomenclature and classification now utilized by our Navy can be readily rearranged to conform with the International Nosological Nomenclature. Such a return would not be of much value from a naval point of view, but should be made as an addition to satisfy census requirements and international agreement.

Navies should be much interested in comparing the importance of the different diseases as they vary in the different naval services. For this purpose there should not only be a fixed nomenclature but also a fixed naval classification. With a satisfactory international nomenclature of diseases, navies would still have a considerable problem to solve, as it would be necessary to secure uniformity in their classification. That could be effected through an international convention. With such an agreement between English-speaking

peoples as has been indicated above much could be accomplished at once by an international convention, even if limited to naval representatives of the two countries.

The more or less recent attempts in this country to secure a satisfactory nomenclature of diseases, and the very fact that there is such a thing as an International Nosological Nomenclature, with a revision in which delegates of 20 governments participated, indicate that the medical man has become more exact in his methods of reaching conclusions and consequently more appreciative of the methods by which satisfactory conclusions can be obtained. He, too, is learning to distrust mere appearances, such as once led the learned to believe that the earth is flat. He is thus thinking less of empiricism and is working to substitute demonstration for dogma. He has even arrived at the stage where theories more or less scientific in form begin to appear. He is talking learnedly of immunity and speaks of antibodies as if they were his intimate friends.

That has been the growth of only a few years and has been apparent chiefly since laboratory methods were developed and came into more or less general use. It is by such methods, for instance, that the study of the cause of disease has been lifted above the waste of mere learned dissertations to the heights that permit better defined, more extensive, and broader views.

The laboratory man in general may still be more or less in the neophyte stage, as it were. He feels the fire and responds to the light and heat. He may so glow with enthusiasm that he nurses the incubator rather than the patient, and his mind may be more concerned with the opsonic index than with the clinical indices. Yet—and this is the point—he has appreciation of what constitutes proof and is insisting upon more exact methods of thinking. He is our scientist, and as such insists upon placing himself within a circle of his own. He is as exclusive as other scientists seem to be, and, although there are exceptions, tends to talk laboratory about all the time. As a bacteriologist he does not seem to think there is anything more in medicine, or even in life, than the microscope and culture methods.

Yet we should be proud of our men in this circle. They not only make much of the professional light that is now shining before men, but they are rapidly increasing the area of the circle and substituting an appreciation of exact methods and of what constitutes proof for the influence of haphazard work and of the resulting individual proclamations that have been so often assumed without proof to state facts. It is the laboratory that is furnishing the leaven, the living material, that is influencing the whole mass and giving us recognized claim to scientific standing in the eyes of the scientific world. And it is under the light of this change that medical optimism takes its

stand, not only in relation to the cure of disease but also in relation to its prevention, with which the question of vital statistics is so strongly blended. "For if thou addest little to little, and doest so often, soon it will become a great heap to him who gathers."

A PLEA FOR A MORE LIBERAL NOMENCLATURE FOR THE NAVAL MEDICAL SERVICE.

By Surg. A. W. DUNBAR, United States Navy.

The Latin nomenclature of diseases, injuries, and conditions at present authorized for the Navy dates from 1894, when a revision and rearrangement of the list, which had been in use for many years, was made. As Form K it is so familiar to the service medical officer that no description is required. Since the above date no extensive revision of it has been made, but some few titles have been added and others dropped, so that it now comprises 377 diagnoses.

It is not, nor does it purport to be, a complete nosology, but, on the contrary, is designed to include only such titles as are more commonly used in the service, others being included in the statistical returns as "other disease of this class." Of the 377 titles appearing on Form K 55 were unemployed in 1909 and 44 in 1910, while in the latter year 117 supplementary diagnoses appear in the returns from ships and stations. Of the latter number 8 are so indefinite as to render classification impracticable, 54 should properly have been entered under titles already in the nomenclature, and 55 are recognized diagnoses which do not appear in the Navy list. It is therefore evident that the list contains many titles of little or no use and omits others, about equal in number, which it would be desirable to include.

The latter fact alone is believed to be a sufficient reason for a more elastic nomenclature, indicating, as it does, the desire of the medical officer to report cases under their correct names and not enter "deflected nasal septum" under "deformitas" along with cases of spinal curvature or hammertoe. In a recent issue of the Bulletin Surg. C. N. Fiske, United States Navy, has noted some of the inconsistencies of and important omissions from the nomenclature, so no further reference to this point will be made other than to state that the necessity for a thorough revision is evident, and it is believed that advantage of this opportunity should be taken to consider the adoption of a nomenclature containing titles of all the disabilities and conditions to which adult males are liable.

It is not desirable that this be a Latin nomenclature, but rather that the terms used be those accepted generally by the medical pro-

profession of this country and with which the medical officer is familiar during his student days and hospital service. The Utopian hope that the medical world will agree upon a common nosology is still unrealized, and even in this country beyond a tentative recommendation of the Bellevue Hospital nomenclature by the committee on nomenclature of the American Medical Association there is no official recognition of any complete nosology by the medical profession. That the present International Nomenclature of the Causes of Sickness and Death is inadequate for use as a naval nomenclature is evident, and the practicability and desirability of any partial expansion for service use is, in the opinion of the writer, doubtful.

It is not practicable because injuries under the international classification are classed not by their nature, but according to the causative agent, which alone would not satisfy the requirements of the Pension Bureau. In a recently suggested expansion of the international list to meet naval requirements it is noted that under class "No. 186, Other external violence" are suggested titles such as "Abrasion," "Contused wound," "Evisceration" and other injuries, but inasmuch as these injuries may be caused by traumatism, by falls, by machines, by vehicles, locomotives, etc., to include them under class No. 186 is fallacious.

It is believed that any partial nomenclature is insufficient for the Navy.

It is eminently desirable that the nomenclature in use in the Navy be similar to that recognized by the profession of the country in general, but it is doubtful that any list designed for the use of a civil community would be entirely acceptable to a military service, which has its own intrinsic problems to solve. For instance, in the Army and Navy it is desirable to determine the number and nature of injuries received in action and the character of the weapon by which inflicted.

Vital statistics are valuable only through comparison either with those from the same source from previous years, or with those of other communities or organizations for corresponding periods.

It is therefore requisite that there should be as few changes in nomenclature from year to year as the advance in medical science permits, and that the titles used should be similar or easily and correctly translatable into the terms and classifications used by other communities or organizations. While comparison of the vital statistics of the Navy with those of civil communities and of the Army is valuable, yet the dissimilar environment precludes a fair estimate of the value of hygienic, sanitary, or prophylactic measures where judged by figures only. It is solely with the naval returns of the great maritime powers of the world that a true basis of comparison

obtains, and for this purpose the international classification is the most adaptable.

The inclusion in the last report of the Surgeon General of a translation of the naval returns into terms of the international nomenclature is an advanced move in this direction which it is hoped may be reciprocated by other navies.

In the Bellevue Hospital Nomenclature of Disease and Conditions it is believed that the Navy has a list which, with the omission of detailed mention of congenital malformations, of the titles of diseases peculiar to females and children, and a few minor changes, is well adapted to its needs, and is easily translatable into the international classification by the means of the key numbers provided.

The objection to any increase in the number of titles in the Navy list is that under the present method of collecting statistics Form K contains each and every diagnosis of the authorized nomenclature making a form already voluminous. To meet this objection and for other purposes it is suggested that this form be altered by the omission of the classification and of the titles of diseases and injuries retaining the ruled forms as now, but on loose leaves for convenience in typewriting.

The nomenclature adopted would then be issued to the service either as a pamphlet or incorporated into the Instructions to Medical Officers, each title having a consecutive Navy key number. The statistical report would then be made by entering the diagnoses consecutively, with their key numbers on the left and followed by the usual entries relative to the admission and disposition of cases as at present. Inasmuch as 95 per cent of the returns from ships and stations utilize less than 50 titles of the present nomenclature, and as only the titles actually used would appear, one sheet would in these cases be sufficient, and even in the case of hospitals where the largest number of titles entered have been 120, four sheets would be ample, as against 13 in the present form.

As the titles would be consecutively arranged the combination of the various returns would be facilitated and the numbers would make reference to any title easy. For the purpose of compiling the international table a keyed nomenclature would be supplied for the use of the statistician.

The classification of the Bellevue list would be retained for that for which intended, i. e., convenience of reference only, and not for statistical purposes, the titles being arranged alphabetically under each class.

In conclusion, it is claimed that by the adoption of the Bellevue nomenclature with the suggested change in Form K that:

1. The medical officer would have complete freedom in his expression of opinion regarding the nature of the disability.

2. That the entering of the key number and the title by the person making the report would prevent errors which now occur through failure to enter the data on Form K directly opposite the diagnosis for which intended; for example, as occurred in a recent return, where this error showed four cases of "Morbus lethargicus" instead of "Morbilli." Of course in this case the unusual diagnosis attracted attention which a more common one would not.

3. That the labor involved in preparing the form would not be increased while the combination in the bureau would be facilitated.

4. That the original cost of the forms would be reduced and the bulk lessened.

5. That all diagnoses would appear in the final combination.

6. That accurate translation of our returns into the titles of the international would be rendered practicable and convenient.

7. That any change in the international classification would not require a change in the Navy list, but simply a rearrangement of the international key numbers on the statistician's copy.

8. That titles might be added by assigning them to unused key numbers left between each class, or might be omitted, without the issuance of new forms or new copies of the nomenclature.

ACID-FAST BACILLI IN THE CIRCULATING BLOOD OF LEPERS.¹

By Passed Asst. Surg. GEORGE B. CROW, United States Navy.

In November, 1909, I reported² finding in the circulating blood of lepers bacilli which in size, shape, and staining properties could not be distinguished from leprosy bacilli.

The technique used: With a syringe, like that used in blood-culture work, 5 to 10 cubic centimeters of blood was drawn from a superficial arm vein, care being taken to avoid diseased areas of skin. This was at once emptied into a clean new test tube containing 5 to 10 cubic centimeters of sterile 2 per cent sodium citrate in normal salt solution; the tube was covered with the thumb, inverted a few times to insure thorough mixing, the plug replaced, the top well flamed, and the tube then placed in the ice box for sedimentation. On the following day some of the sediment and preferably the upper, or leucocyte, layer was drawn up with a pipette and rather thick smears made on new clean slides. The slides were dried with moderate heat and then placed in distilled water. In 5 to 15 minutes the red cells dissolved, leaving a thin "ground glass" layer of leucocytes. The slides were then dried, fixed by heat, and stained. Further reference to the technique will appear later on in this article.

Other cases have been examined, a total of 24 inmates of the leper colony in Guam, in 21 of which the bacilli were present.

¹ Received for publication Sept. 14, 1911.

² United States Naval Medical Bulletin, Apr., 1910.

Following are the tabulated results of these examinations:

TABLE No. 1.

Date of examination.	Name of patient.	Age	Physical findings.	Smears from nose.	Blood findings.
Aug. 15, 1909	1. Joaquin Perez.....	30	Nodosities of face and typical thickening of ears. Skin dry and scaly. Dry ulcerations over elbows and on feet and legs. Atrophy of fingers. Lower extremities somewhat enlarged.	Positive.	Bacilli in large numbers, singly and in groups.
Aug. 17, 1909	2. Pedro Atolgue.....	13	Well-marked case. Nodosities of face and marked thickening of ears. Eyebrows absent. Skin dry and shiny.	...do....	Bacilli in moderate numbers.
Aug. 21, 1909	3. Vicente Castro Nego.	23	Face fairly typical. Slight thickening of ears, atrophy of fingers. Left foot much shortened from atrophy.	Not examined.	Negative.
June 9, 1910	.....do.....	.....do.....	.....do.....	.....do....	In one slide 2 bacilli within a leucocyte. In another slide 2 in same field outside a leucocyte. Bacilli in moderate numbers.
Aug. 23, 1909	4. Andreas Meno.....	44	Face typical of tubercular type. Marked thickening of ears. Eyebrows gone, skin over legs and over extensor surfaces of arms rough and scaly. Some brawny enlargement of feet and legs. Ulcerations plantar surface right foot. Some atrophy of toes. Slight anesthesia of hands, marked over extensor surfaces of third and fourth fingers. Anesthesia feet and lower half of legs.	Positive.	Bacilli in moderate numbers.
Aug. 24, 1909	5. Jose Blas Deso.....	30	Skin of legs shows general thickening and scaling, with a few dry ulcerated areas. Says legs feel dead. Touch sensation dulled dorsum feet. Forehead much wrinkled.	...do....	Do.
Aug. 26, 1909	6. Augustin Agulta...	31	Small, thickly set, scaly elevations over body, marked roughening of skin of legs. Beginning atrophy three toes left foot. Left leg and foot edematous. Thumbs mere stumps. Partial touch anesthesia hands and feet.	Not examined.	Negative.
Nov. 20, 1909	.....do.....	.....do.....	.....do.....	.....do....	After long search 2 bacilli lying end to end and 1 group of 6.
Aug. 28, 1909	7. Antonio Tenorio ...	50	Part of nasal septum gone but ulceration now healed. Atrophy two distal phalanges left index finger. Right arm amputated at elbow 2 years ago because of greatly enlarged and ulcerated hand, supposedly leprous. Large scars over right scapula and middle third right leg—probably not result of leprous lesions.	Negative.	After long search 1 single bacillus and 1 group of 3.
Aug. 30, 1909	8. Vicente Paulino....	38	Skin dry, especially over feet. Some thickening of skin of face; eyebrows sparse. A few erythematous spots over trunk. Touch anesthesia dorsal surface third and fourth fingers right hand.	...do....	Bacilli numerous; they occur singly and in various sized groups.

TABLE No. 1—Continued.

Date of examination.	Name of patient.	Age.	Physical findings.	Smears from nose.	Blood findings.
Aug. 31, 1909	9. Vicente Acfalle.....	40	Typical face of advanced stage. Scattered nodules up to 1 c. m. in diameter over almost entire body. Atrophic ulcer palmar surface tip fourth finger right hand.	Positive.	2 bacilli after long search.
Sept. 2, 1909	10. Juan Umpingco...	32	Rather widespread erythema. Thickening and ulceration of skin about elbows. Tubercle 1 c. m. in diameter, inner surface junction middle and lower third right arm. Some tubercular-like masses about toes.	...do....	Bacilli found with ease. Occur most often singly, but sometimes in small groups.
Sept. 4, 1909	11. Jose Taitinfong....	43	Chest, neck, and shoulders very muscular; legs small and weak. Ulcerating tubercles about right elbow. Left foot mere stump. Great toe and fourth toe absent. Fifth toe right foot gone. Considerable atrophy fingers. Touch anesthesia of hands.	Negative.	About 15 bacilli in 40 minutes' search.
Sept. 7, 1909	12. Luis del Rosario...	(1)	[In this case the data was written on a scrap of paper and by an oversight was not copied into the book kept for records on these cases. I remember that the man was middle aged and that there was considerable atrophy of the digits. The laboratory findings were noted in book at time of examination of smears as in other cases.]	Not examined.	Bacilli found in moderate numbers.
Sept. 9, 1909	13. Juan Taijeran.....	38	Anesthesia of hands and lower half of forearms. Fingers in permanent semi-flexion. Scar left hand—result of burn while fishing with a torch for light. Experienced no pain when burned. Does not feel pin pricks.	...do....	Bacilli in great numbers, nearly all in clumps and mostly in and about leukocytes.
Sept. 16, 1909	14. Vicenta Quidachay Ogo.	43(?)	Right thumb mere stump and index and second finger shortened. All fingers left hand shortened. Third toe left foot atrophied. Distal phalanx great toe right foot gone, excepting nail. Eyebrows sparse.	...do....	Few bacilli.
Sept. 18, 1909	15. Vicenta de la Cruz.	40(?)	Some touch anesthesia both hands. Atrophy fingers and of first, second, and third toes right foot. Left foot smaller than right and somewhat shortened. Eyebrows sparse.	...do....	In a mass of leukocytes 15 or 20 bacilli, also 2 bunches each of 6 or 8.
Nov. 19, 1909	16. Jose Charlauros....	22	Skin of face and ears much thickened. Fingers of normal length but taper markedly at ends. Dry, rough skin over forearms and beginning ulcer over right elbow. Toes very slender. Skin of legs dry and rough. Ulcers about right ankle.	...do....	Bacilli abundant.
Jan. 19, 1910	17. Eliousio Cabo.....	75	Eyelashes sparse. Contracture fingers left hand, and atrophy distal phalanx index and middle fingers left hand. Right hand practically same. Some shortening fourth and fifth toes left foot. Skin over much of body rough and scaly.	...do....	Negative.
Aug. 8, 1910	...do.....	75	...do.....	...do....	Do.

1 Adult.

TABLE No. 1—Continued.

Date of examination.	Name of patient.	Age.	Physical findings.	Smears from nose.	Blood findings.
Jan. 21, 1910	18. Francisco Manibusan.	35(?)	Upper part of nasal septum gone. Right nasal opening almost obliterated, result of scar. Thick set pustular eruption upper lip. Large old scar dorsum left hand, and index finger set back (but not shortened itself), result of partial destruction of metacarpal bone, apparently bone absorption. Contracture fingers right hand due to old scar wrist. Great toe left foot missing, apparently amputated as nail is not present.	Negative	Negative.
Aug. 1, 1910	do.	do.	do.	do.	Do.
Feb. 24, 1910	19. Dominga Tenorio Tenorio.	50	Old ulcer, anterior surface right leg and scarred edges show that it was formerly much larger. Foot larger than normal due to thickened skin and subcutaneous layers. Skin of foot hard and brawny, and in some portions warty. Third toe shortened. Itch-like eruption left leg	do.	After long search 5 bacilli found, 2 singly and 3 within a leukocyte.
Feb. 4, 1910	20. Antonio Ticongo (Chinese).	80	Left leg flexed at right angles on thigh and much atrophied. Several old scars on leg and foot, whole foot atrophied to considerable degree and narrowed at anterior end. Toes entirely missing—typical bone absorption.	do.	After long search 2 bacilli found.
Feb. 8, 1910	21. Nicolas Meno.	69	Face fairly typical. Left leg 2 inches short, due to atrophy of foot and of leg below knee. Much smaller than normal. Skin over that portion of leg shiny and much darker in color.	do.	In 2 hours' examination 5 single bacilli and 1 group of 3 in a leukocyte.
Mar. 1, 1910	22. Julian Cabo (son of No. 17).	30	Skin covered with dry scaly eruption. Nasal septum almost entirely gone and nose flattened. Bone absorption of fingers, both hands, down almost to first phalanx: on some the nail lies just distal to first interphalangeal articulation. Toes show same degree bone absorption. Sensation not acute, but responds to pin pricks.	Positive.	Negative.
Mar. 18, 1910	23. Josefa Quintilla.	38	Depressed nose from vomer absorption. Sparse eyebrows and fairly typical face. Fingers taper at end. Foul-smelling ulcers about toes.	do.	Do.
July, 30, 1910	do.	do.	do.	do.	In 2 hours found 2 in one field, in another 1 beaded bacillus within a leukocyte, and another showed 1 solid red bacillus.
May 24, 1910	24. Vicente Pangalinan.	24	An acute case of nodular type. Many irregular, red, elevated areas up to 2 c. m. in diameter. Serum from these show typical bacilli. Both ears thickened.	do.	Many bacilli.

Early in the year 1910 there appeared criticisms of Rosenberger's results in his examination of the blood of tuberculous cases, some of these critics¹ calling attention to the fact that distilled water may at times contain acid-fast bacilli.

In my work distilled water was used throughout in making up the citrate solution and the stains, in washing the slides, etc. The distilled water used in the laboratory of the United States Naval Hospital in Guam is carried from the distilling plant, a distance of several hundred feet, through an iron pipe and is drawn in the laboratory through an ordinary tap. At that time the whole hospital was supplied with distilled water and, as the supply of the plant was limited, the pipes always contained freshly distilled water. Repeated examinations of this water for acid-fast bacilli were negative. Repeatedly, a few drops of water from the tap were allowed to fall on agar slants and rarely did they show any growth whatever, and never were any acid-fast organisms noted. One day afterwards, however, I noticed a small gelatinous growth in the tap, and stained smears of this material showed it to be composed of short and rather thick bacilli. Almost all of these were nonacid-fast, but in a field containing, say, several thousands of these organisms, there was noted an occasional acid-fast bacillus. These acid-fast organisms stained evenly and were uniformly short and thick, about half to two-thirds the length and perhaps twice the thickness of the acid-fast organisms noted in the examination of the blood smears.

In all these blood examinations acid-fast bacilli were the only organisms noted. In every case these organisms were long and slender, and many showed the sharply pointed ends so characteristic of those found in the nasal discharges and leprous nodules. Many were beaded. Some were slightly curved.

Realizing, however, that the presence of the acid-fast organisms in the blood smears might have been due to contact with contaminated water, I began a reexamination of these cases, using additional precautions to exclude such contamination. Instead of drawing water from the laboratory tap, it was obtained at the distilling plant, directly from the tank which first receives the output of the condensers. The water in this tank is nearly always at a temperature too high to permit bacterial growth. This water was collected in flasks, which had been previously rinsed with concentrated nitric acid, the acid being rinsed out just before filling the flasks. In the laboratory the water was redistilled from these flasks and collected in flasks which had been thoroughly rinsed first with concentrated nitric acid, then with alcohol, and finally with ether. In this redistillation a small all-glass condenser was used, the condenser being

¹ The Alleged Presence of the Tubercle Bacillus in the Circulating Blood of Tubercular Cases. E. Burvill-Holmes, *Am. Jr. Med. Sc.*, Feb., 1910.

rinsed in the same manner as the flasks. The connection between condenser and flask was such that no water could pass over except as steam. After thus redistilling the water, the receiving flasks were plugged with sterile cotton and sterilized in the autoclave. The date was marked on each flask. No such water was used when it had become more than two weeks old. Repeated cultures from such water were negative. The test tubes for receiving the freshly drawn blood were first thoroughly washed with soap and water, then rinsed with nitric acid, alcohol, ether, and finally with a little of the redistilled water. The sodium citrate normal salt solution was made by putting the required amounts of C. P. sodium citrate and of sodium chloride into a given quantity of redistilled water, the graduate used for the mixing being previously rinsed with nitric acid, alcohol, and ether; 5 to 10 cubic centimeters of this solution was then poured into each of the prepared test tubes; the tubes were plugged with sterile cotton, and then placed in the sterilizer. Redistilled water was used in making up the stains, and the bottles in which the stains were kept rinsed, as in the case of other vessels noted. A Luer all-glass 10 cubic centimeter syringe, with ground-glass plunger and nipple and fitted with platino-iridium needle, was used for drawing the blood. This syringe was not used for any other purpose. Before drawing the blood, in each case the syringe was immersed for 5 to 10 minutes in concentrated nitric acid, the acid poured off, the syringe rinsed with alcohol, and then immersed in alcohol in a large porcelain evaporating dish, the latter being covered with the lid of a petri dish until ready for use. The porcelain dish and the cover were previously rinsed as above. The needle was immersed for 10 minutes in 20 per cent caustic soda solution; the soda solution was rinsed off with alcohol, and the needle dropped in with the syringe. The operator wore close-fitting rubber gloves. The gloved hands were washed with liquid soap and water and rinsed with Harrington's solution and with alcohol, both being poured from a clean bottle onto the hands. The patient's arm was washed in the same manner. Sterile towels were placed about the arm. The gloved hands of the operator were again rinsed with alcohol. The syringe was now taken out of the porcelain dish and rinsed by drawing through it, first, a little redistilled water and then some citrate solution. A healthy-looking area of skin was chosen and 10 cubic centimeters of blood drawn from one of the large veins. An assistant flamed the top of the tube containing the citrate solution and removed the plug. The blood was emptied into the tube, the top of the tube covered by the gloved thumb of the operator, the tube inverted a few times, and the cotton plug replaced. The top was again flamed and the tube set in the ice box for sedimentation. The syringe and needle were at once thoroughly washed in water and then immersed in nitric acid and

caustic soda solution, respectively. They were rinsed in alcohol, as before, and laid away until used on the next case. (It may be mentioned here that all the apparatus used in this work was kept together, when not in use, in an almost dustproof compartment, and none of it used in any other work.) The next day, after drawing the blood, smears were made, as explained in the beginning. Experience had shown that the bacilli were more easily found if the smears were made from the leukocyte cream. The pipette used in drawing up the sediment before being used in each case was immersed for one hour in concentrated nitric acid, then rinsed with alcohol and ether. Only new slides were used. They were prepared by immersing overnight in a sulphuric acid—potassium bichromate solution—and then rinsing in alcohol and ether. They were wrapped in paper in bunches of convenient size for use in each case. These packages were then sterilized and kept in a tight box until used. Three or four rather large drops of the sediment were placed on each slide and spread with the end of the pipette. The smears were dried with moderate heat. If the smears are dried insufficiently or too slowly the leukocyte layer will not adhere to the slide when the red cells are being hæmolyzed; if the smears are overheated in drying, the red cells will not completely dissolve. Such a smear comes out too thick to transmit sufficient light for examination, and, too, any acid-fast organisms would be indistinguishable in the mass of red cells, which are also acid-fast. Careful attention to this drying is important. The following procedure in drying the slides proved satisfactory:

An alcohol flame was placed under one end of a rather thick copper plate, and when the temperature of the plate had become constant a point was selected that was just slightly too warm for comfort when a finger was held in contact with it. The freshly made smears of sediment were placed about an inch outside of this point and dried for at least one hour. I found that in the process of dissolving off the red cells the smears were less likely to slip off if the slides were taken directly from the drying plate when placed in distilled water. If the slide was not taken directly from the copper plate, but allowed to stand cold for any length of time, the smear would absorb considerable moisture from the air which in Guam always has a high humidity. To dissolve off the red cells the dried smears were placed in redistilled water in a Novy staining jar. No two sets of smears were made on the same day; and when not in use this jar was kept filled with concentrated sulphuric acid, and the acid rinsed out with alcohol and redistilled water before the jar was to be used. The jar was always kept covered. Immersion of the smears in redistilled water for 5 to 10 minutes was generally sufficient to dissolve off the red cells. This leaves the slides covered with a clean-looking white film. (In removing the slides from the jar they should be handled

gently for there is often a tendency for the film to peel off.) The slides were then removed and placed on end on the drying plate until dry. The smears were then fixed by heat and stained with carbol-fuchsin for 5 minutes in the cold. The stain was washed off with redistilled water. The slide was then dipped in 5 per cent sulphuric acid for 2 or 3 minutes and then a few drops of Gabbet's fluid were poured on the smears. In 5 minutes this was poured off and the slide again washed with redistilled water. It was again dried on end on the copper plate. If the stained smears were not examined at once they were placed in a practically air-tight cabinet until examined. A satisfactory slide should have in each field 30 to 60 leukocytes, the nuclei of which should have a clear cut blue stain; and there should be little or no red-cell débris.

Ten cases were examined using the above technique. Eight of these showed bacilli which in size, shape, and staining properties were identical with leprosy bacilli. The following table shows the results. The cases are the same as those under the same numbers in the first table.

TABLE No. 2.

Date of examination.	Case No.	Blood findings.
Dec. 17, 1910	1	Slide (a): 5 bacilli in an irregular group, no 2 in contact. Another field, 2 end to end. All very clear. Slide (c): 5 lying apparently within the cytoplasm of 2 adjacent leukocytes, 3 beaded, 2 solid. Others found easily.
Jan. 7, 1911	2	Bacilli found in almost every field. They occurred singly and in clumps of 2 or 3, but most often in clumps of 3 to 20. Sometimes occurred lying close together and parallel forming the "cigar bunches." Often in leukocytes, many were beaded. Pointed ends were prominent.
Jan. 11, 1911	3	One field, clump of 10, mostly parallel. Another field showed a group of about 40 arranged irregularly in what looked like a cell without a nucleus.
Jan. 17, 1911	5	Bacilli in moderate numbers. Mostly singly and in twos. One group of 4.
Jan. 19, 1911	6	Negative.
Feb. 12, 1911	7	Do.
Mar. 9, 1911	8	Bacilli found easily. Slide (a): 1 field showed 3 bacilli, 2 of which were beaded. Another field 4 bacilli within a leukocyte. A third field showed a single bacillus—all in 10 minutes search. Slide (b): 2 lying parallel in edge of leukocyte.
Mar. 12, 1911	9	One field showed 2 clumps of about 20 each, another field showed 2 bacilli, another 1. Many beaded, many pointed at ends.
Mar. 25, 1911	10	A few scattering ones noted, and one whole field literally studded with bacilli.
Apr. 6, 1911	11	A few (4) single bacilli found in a long examination.

In the examination of the cases given under the first table the same precautions as in these later examinations were taken to prevent contamination of smears and apparatus, except as regards the water.

It will be seen that the results in the later examinations (Table No. 2) correspond closely with those in Table No. 1. Cases No. 6 and No. 7 were negative in the later examination. Under the first technique case No. 6 was negative at one examination and in a later examination showed very few organisms. Case No. 7 showed only a few organisms under Table No. 1. The other cases gave the same results throughout.

In considering this work it would seem that two points are of importance: First, were the cases examined lepers? Second, were the organisms found in the blood smears leprosy bacilli?

In Table No. 1 under "Physical findings" will be found sufficient evidence to identify most of the cases as lepers. (Under "Physical findings" the words "atrophy" and "shortening" refer to changes produced by typical leprosy bone absorption.) All of the cases reported are inmates of the leper colony in Guam and no case is recluded in that colony unless a diagnosis is agreed upon by a majority of the four medical officers on duty there. I am inclined to believe that case No. 18 is an old luetic infection rather than leprosy.

Were the organisms noted leprosy bacilli? They stained like leprosy bacilli and they had the morphology of that organism. Sediment from three positive cases was smeared on glycerin agar and also placed in bouillon, and there was no growth. Two guinea pigs were each inoculated with 2 cubic centimeters of sediment and at the end of four months showed no effects. I do not believe that the organisms, at any rate in these last examinations, came from the water. Of course, air contamination of any smear is possible, but in general laboratory work we do not throw out results on such a possibility, and we would not expect smears contaminated from air to show always the same organism. To my mind the greatest possibility of contamination was from the skin in inserting the needle when blood is drawn. With one exception healthy areas of skin were selected for the drawing of blood. In the exception, case No. 11, an area free from nodules was chosen in front of the elbow, but the skin was somewhat thickened. After the withdrawal of the needle serum was expressed from the skin wound and two smears of this serum were negative.

In the examination of all the blood smears any object that in any way resembled an artefact was not considered. In nearly every case one or more fields showing the bacilli were shown to one or more of the other medical officers on duty at the hospital in Guam and they identified the organisms as identical with leprosy bacilli in size, shape, and acid-fastness.

These medical officers, Surg. H. E. Odell, United States Navy, and Passed Asst. Surgs. F. E. Sellers and H. A. Garrison, United States Navy, were also satisfied that no detail of the technique was neglected.

None of the cases examined showed evidence of any other disease that might confuse these results. The scarring referred to in some of the cases was probably the result of old luetic lesions.

A number of apparently healthy persons, including two Americans, were examined as controls with negative results.

Conclusion.—The above results lead me to believe that leprosy bacilli may be found in the circulating blood of lepers in 80 per cent of cases and possibly in every case, if sufficient care and diligence is used

in the examination. The organism is in some cases extremely difficult to demonstrate. It is most easily found in the rapidly progressive tubercular type.

**THE TENTH CONVENTION OF THE SECOND HAGUE CONFERENCE OF 1907
AND ITS RELATION TO THE EVACUATION OF THE WOUNDED IN NAVAL
WARFARE.¹**

By Surg. FRANK L. PLEADWELL, United States Navy.

Article 5 of the Tenth Convention deals with the distinctive marks of a hospital ship.

ARTICLE 5.

Military hospital ships shall be designated by being painted white outside, with a horizontal band of green about a meter and a half in breadth.

The ships mentioned in articles 2 and 3 shall be designated by being painted white outside, with a horizontal band of red about a meter and a half in breadth.

The boats of the ships above mentioned, as also small craft which may be used for hospital work, shall be designated by similar painting.

All hospital ships shall make themselves known by hoisting, with their national flag, the white flag with a red cross provided by the Geneva convention, and further, if they belong to a neutral State, by flying at the mainmast the national flag of the belligerent under whose control they are placed.

Hospital ships which, in the terms of article 4, are detained by the enemy must haul down the national flag of the belligerent to whom they belong.

The ships and boats above mentioned which wish to insure by night the freedom from interference to which they are entitled must, subject to the assent of the belligerent they are accompanying, take the necessary measures to render their special painting sufficiently plain.

This provides that hospital ships of the military variety shall be painted white outside, with a horizontal band of green $1\frac{1}{2}$ meters wide, other hospital ships having a red band in place of the green, these bands to extend from stem to stern at about the height of the main deck. Distinctive marks of this character are essential to enable belligerents to clearly discern the nature of this vessel from a distance. This article also prescribes that the boats and small craft of a hospital ship shall be distinguished by similar painting. Here is also finally settled the question of the flag or flags which ships of this character shall fly. They must, of course, hoist the red-cross flag of the Geneva convention, which is the national flag of Switzerland, with the colors reversed. (See Art. 18, Geneva Convention, 1906.) This flag usually appears at the main, although it may be hoisted at the fore,² and in the case of nonofficial hospital ships from a neu-

¹ The first portion of this paper appeared in Vol. V, No. 4, United States Naval Medical Bulletin, October, 1911.

² When the U. S. hospital ship *Relief* was commissioned the red-cross flag was flown from the fore, but later, under instructions from the Navy Department, it was shifted to the main, replacing the commission pennant in the latter situation. (Report of the Surgeon General, United States Navy, 1908, p. 116.)

tral State this is where it should appear, leaving the main for the national flag of the belligerent under whose control it (the ship) is placed. The flag of the nation to which a hospital ship belongs always appears in the usual place, at the ensign staff aft. If a neutral hospital ship is detained by the enemy it must haul down from the main the flag of the nation under whose control it may be, retaining, however, its own national flag at the ensign staff, while other hospital craft detained by the enemy are required to haul down the national flag of the belligerent to whom they belong. It will be noted that when neutral hospital ships are detained by the enemy they retain their own national flag, and it is apparent that this disposition is not in complete harmony with articles 21 and 22 of the Geneva convention, upon which this article respecting hospital ship flags is based. Neutral ambulances or hospitals on shore under similar circumstances, when in the enemy's lines, may fly the flag of the Geneva convention only. However, the peculiar conditions at sea may be alleged as a basis for somewhat different treatment. A hospital ship detained by the enemy is hardly comparable to a shore hospital included within the lines of the enemy.

The Turkish and Persian delegates to the convention reserved the right of replacing the red cross on the flag by the red crescent and the red lion (or the red sun), respectively. Their appeal for reciprocity in this direction was accepted by the several delegations, but not by the conference as a whole. In the convention of 1889 the representative from Siam likewise stated that his Government places beside the red cross an emblem sacred in the Buddhist religion, also in red, and called "The flame." During the Russo-Japanese War the Japanese, in addition to flying the distinctive flag of the Geneva convention, painted the red cross on the smokestacks of their hospital ships.¹ The Russian hospital ships adopted the same device.

The final paragraph of article 5 refers to the measures that may be taken to insure that a hospital ship shall be recognizable at night, but does not definitely indicate how this shall be done, simply stating that they must "take the necessary measures to render their painting sufficiently plain." The novel suggestion was made that this might be done by the use of phosphorescent paint,² but it is hardly conceivable that this method would be acceptable from a military point of view, even if effective. A more practicable suggestion is that in case of attack such a ship may readily reveal its neutral identity by means of reflectors or searchlights playing on its distinctive painting or upon the red-cross device on smokestack or flag.

¹ See illustrations, pp. 9, 14, and 16, in "Report on the Japanese Naval Medical and Sanitary Features of the Russo-Japanese War." Braisted, W. C., surgeon, United States Navy, and also opposite p. 123, "The Great Siege" (Port Arthur). B. W. Norregard, correspondent Daily Mail, Russo-Japanese War; and p. 1068, "Naval Surgery." P. M. Rixey. *Keen's System of Surgery*, Vol. IV.

² See London Times, July 15, 1907.

A proposition emanated from the German delegation in the Hague Conference that all hospital ships should carry three lights—green, white, green—placed vertically one above the other and separated by at least 3 meters.

This point of special lights on hospital ships had been raised by the Russians during the Russo-Japanese War, they having notified Japan through the intermediation of the French Government that they (the Russians)—

Propose to use by night three vertical lights for her hospital ships—white, red, white—but the Japanese Government declined to accept these distinguishing marks, as conferring special privileges, being apprehensive of various possible dangers which might arise as the result of such a contrivance being availed of by an unprincipled enemy. Objections were also raised in committee to the German proposal, which made the carrying of distinctive lights obligatory, and it failed of acceptance. A light on a hospital ship may betray the presence of the fleet, and hospital ships must conform to the order for "lights out" in the same way as ships under a belligerent's command. * * * A warship might also make illicit use of the lights to effect its escape.¹

Upon this question of how to make a hospital ship recognizable by night, the opinions of the surgeons of the Japanese hospital ships, formulated after the full experience of the Russo-Japanese War, are of considerable interest in this connection, even if they are not conclusive, and are quoted as elicited by the inquiries of Prof. Takahashi. Sixteen different officers from as many ships expressed the following opinions as to the best methods of making a hospital ship distinguishable at night. All except two voiced their preference for some system of lights. One considered the throwing of a beam of light from a searchlight on the name of the vessel, or upon the red-cross flag, or the red-cross device on the smokestack to be preferred to lights. One surgeon stated that "In the face of the enemy, a light on a hospital ship betrays the anchorage of the fleet. To recall an instance: While our ship was off Gensan, Korea, even the slightest sign of light was prohibited by the naval authorities. Though almost intolerable for the sick and wounded, especially in the hot season, to have windows and apertures shut up, yet under such circumstances the directions of the authorities should be observed." Another stated that "No special light will be necessary, for whenever a warship happens to meet another vessel it throws over it a blaze of searchlight."¹

In settling this question, the Commission finally adopted a text which met the various objections by providing "that these ships may take such precautions to insure their recognition and safety at night as will reveal their special marks and be subject to the approval of their military authorities." (General Report.)

¹ Takahashi. See ante.

ARTICLE 6.

The distinguishing signs referred to in article 5 can only be used, whether in time of peace or war, for protecting or indicating the ships therein mentioned.

Article 6, which aims to restrict the irregular use of the Red-Cross emblem, arises out of article 25 of the Geneva Convention. As this article and article 21 imply the power to bring about legislative enactment, Great Britain made a reservation against them to the extent of not engaging to promise a complete fulfillment on the part of the United Kingdom. (See arts. 19, 20, 27, 28, Geneva Convention. 1906.)

ARTICLE 7.

In the case of a fight on board a war ship, the sick bays shall be respected and spared as far as possible.

The said sick bays and the material belonging to them remain subject to the laws of war; they can not, however, be used for any purpose other than that for which they were originally intended, so long as they are required for the sick and wounded.

The commander into whose power they have fallen may, however, if the military situation requires it, apply them to other purposes after first seeing that the sick and wounded on board are properly provided for.

Article 7 provides that "in case of a fight on board a war ship the sick bays are to be respected and spared as much as possible." As Prof. Higgins states, "This recalls a condition of warfare much more common a century ago than now, when hand-to-hand fighting on board a vessel is an extremely rare occurrence in naval engagements. It is not to be expected that in engagements where the combatants remain at a distance from each other the sick bays can be respected, and the text of the article makes it clear that it only refers to conflict taking place on board the ships themselves."

As a matter of fact the sick bays in recent ships of war, being placed on the upper decks so as to have in peace time the advantage of light and air, are more vulnerable than were sick bays in former types, and they are for this reason vacated and abandoned during war, certainly upon the prospect of action, personnel and material being shifted to the protected battle dressing stations.

The material of the sick bays mentioned in the second paragraph of article 7, if it is to be assimilated to the medical material of establishments on shore, in order to secure exemption from use by an enemy, should be appropriately marked with the Red-Cross emblem on a white ground. (See art. 19, Geneva Convention, 1906.) Doubtless also material designed for the use of the sick and wounded on hospital ships or other medical units should be similarly marked, but in the case of the medical material of nonofficial ships fitted out either by individuals or relief societies an exact assimilation to the

material of military hospital ships is not allowable. The latter material may be regarded as private property, and whenever found is subject to requisition, and if not paid for in cash, should be properly receipted for. It should also be marked, in addition to the Geneva Cross, with the name of the society or individuals who fitted out the ship, as a means of identification. "In no case can the sign or emblem of the Geneva Convention be recognized unless it is used with the permission of competent military authorities. The permission is signified either by a written authorization or by an official stamp on the sign."¹

With respect to the second paragraphs of article 7 stating that "the said sick bays and the material belonging to them remain subject to the laws of war," it is to be noted that under the provisions of article 29 of the declaration of London,² articles serving exclusively to aid the sick and wounded are not contraband and shall not be confiscated; but it is also provided that they may be requisitioned, upon payment of compensation, if required by urgent military necessity, provided they are destined for the enemy or enemy territory.

ARTICLE 8.

The protection to which hospital ships and sick bays of vessels are entitled ceases if they are made use of to commit acts harmful to the enemy. (Cp. G. C., 1906, art. 7.)

The fact of the staff of the said ships and sick bays being armed for maintaining order and for defending the sick and wounded, and the presence of wireless telegraphy apparatus on board, are not sufficient reasons for withdrawing protection.

The import and bearing of the first paragraph of this article has already been sufficiently dwelt upon. (See ante.) The second paragraph of article 8 grows out of a similar provision in article 8 of the Geneva Convention.³

The fact that the staff of the hospital ship or sick bay are armed for maintaining order or defending the sick and wounded and the presence of wireless-telegraph apparatus on board are not sufficient reasons for withdrawing the protection accorded to such ships or sick bays.

¹ See "Notes on the Laws and Usages of War." Edmonds and Macpherson. Jour. R. A. M. C., September, 1909.

² ART. 29. * * * the following may not be treated as contraband of war: (1) Articles serving exclusively to aid the sick and wounded. They can, however, in case of urgent military necessity and subject to the payment of compensation, be requisitioned, if their destination is that specified in article 30.

ART. 30. Absolute contraband is liable to capture if it is shown to be destined to territory belonging to or occupied by the enemy or to the armed forces of the enemy. It is immaterial whether the carriage of the goods is direct or entails transshipment or a subsequent transport by land. (Declaration of London.)

³ Article 8, G. C., 1906, provides that "in default of armed orderlies, a piquet or sentinels taken from a combatant army and used as a guard to the medical unit is entitled to be considered medical personnel; but such guard should be furnished with a certificate or statement from responsible authority. They need not wear the Red Cross badge." Arms and ammunition received from the sick should not be held in the medical unit longer than necessary, but should be handed over to the proper department.

The German draft proposed to allow hospital ships to carry light pieces of artillery as a protection against the dangers of navigation and particularly of piracy, but the committee considered that there was no necessity for the arming of such ships, especially as merchant ships, which run no greater risks, are unarmed. (Higgins, p. 386.)

This does not apply, however, as pointed out by Admiral Sperry, that they may not have a signaling gun for use in emergency and firing only blank charges, and this is mentioned in the general report as being entirely admissible.

The general report on this article also points out that if a commissioner is placed on board a hospital ship, agreeably to article 4, in the event of the ship being detained by the enemy the latter must refrain from considering such a commissioner in the light of a prisoner of war.

The paragraph regarding the presence of wireless-telegraph apparatus on board was inserted on the proposition of the Dutch delegate. The apparatus may often be of great value in enabling hospital ships to communicate either with ships of their own squadron or with land. Any abuse of it can easily be prevented by agents being placed on board, and, if necessary, the apparatus may be removed temporarily under the general powers of control conferred on belligerent commanders by article 4. (Higgins, p. 386.)

With regard to the use of wireless on board hospital ships it may be affirmed that it should be permitted in the interest of efficiency, and that if suspicion should attach to its presence it would be an easy matter to restrict its use solely to the receipt of messages.

ARTICLE 9.

Belligerents may appeal to the charity of the commanders of neutral merchant ships, yachts, or boats to take on board and tend the sick and wounded.

Vessels responding to this appeal, and also vessels which have of their own accord rescued sick, wounded, or shipwrecked men, shall enjoy special protection and certain immunities. In no case can they be captured for the sole reason of having such persons on board; but, subject to any undertaking that has been given to them, they remain liable to capture for any violation of neutrality they may have committed.

Article 9 is based on article 5 of the Geneva Convention. Under its provisions belligerents may appeal to the charitable zeal of neutral merchantmen to take on board and care for sick and wounded, but a belligerent can not compel a neutral to perform the service, and assistance thus rendered is purely voluntary. Such ships rescuing the disabled, either upon appeal or of their own accord, are to enjoy "special protection and certain immunities."

Prof. Higgins states with reference to these expressions, which are borrowed from the Geneva Convention, that they—

are vague, but as the general report of the committee remarks: "It is scarcely possible to proceed otherwise; everything depends upon the circumstances. A warship may call upon a ship possibly from a distance, promising, for instance, not to search it. It is obvious that the advantages of the immunities are not so

great in naval as in land warfare, in which the inhabitants to whom such an appeal is made are exposed to a series of rigorous measures on the part of the invader or occupant. It is before all a question of good faith. A belligerent should keep the promise which he has made to obtain a service, and the neutral ought not by any appearance of zeal to be able to escape the risk to which his conduct may have rendered him liable. It is, however, certain on the one hand that the ships in question may not be captured for the transport of shipwrecked, wounded, or sick of the belligerent, and on the other hand, as is expressly stated by article 6 of the Convention of 1890, they remain subject to capture for violations of neutrality which they may have committed (i. e., contraband of war, breach of blockade). There is no immunity accorded to a merchantman belonging to one of the belligerents conveying sick and wounded."

That such neutral ships are to be entitled equally to "special protection and certain immunities," both when they act upon their own initiative and also when they act upon appeal from a belligerent, appears plain from the text of this article, but a somewhat different interpretation has been placed upon it by at least one writer. Prof. Higgins, just quoted, makes plain his belief in the idea that it makes no difference in the immunities to be extended whether these vessels act on their own accord or upon request from the belligerent, but the following statement, taken from Prof. Hull's work on *The Hague Conferences*,¹ may be quoted as representing a different view, as follows:

that only in case they (i. e., neutral nonofficial vessels) acted upon such request (of the belligerent), and not on their own initiative, were they to be "given special protection and certain immunities." This restriction of the charitable activity of neutral vessels was defended on the ground that such rescue work is not a right conceded to neutral ships by international law, or by logic or humanity; but that to request it should be a right conceded to belligerents which they would not be slow to exercise, and that humanity would dictate compliance with the request on the part of the neutral vessel.

It may be stated that this latter view of Prof. Hull is in agreement with the phraseology of article 5 in the Geneva Convention, upon which this article 9 of *The Hague Convention* is based, but the language of the latter article is not at all ambiguous on this point, and the intention is apparent from its context, not only that both these neutrals who respond to an appeal, but also those who offer their services spontaneously, are to be entitled to the "special protection and certain immunities" specified. As a rule, however, services of this character will probably be better performed and be more easily regulated and controlled if they are rendered upon request of the belligerent rather than voluntarily.

ARTICLE 10.

The religious, medical, and hospital staff of any captured ship is inviolable, and its members can not be made prisoners of war. On leaving the ship they take away with them the objects and surgical instruments which are their own private property.

¹ Hull: *The Two Hague Conferences*, p. 116.

The staff shall continue to discharge its duties while necessary, and can afterwards leave, when the commander in chief considers it possible.

The belligerents must guarantee to the said staff, when it has fallen into their hands, the same allowances and the same pay as are granted to the persons holding the same rank in their own navy.

Article 10 deals with the inviolability of the staff of a hospital ship and the payment of salaries to be made to the staff when detained by the enemy. The conference of 1899 required that belligerents must guarantee to the staff that has fallen into their hands the enjoyment of their emoluments intact, and in the debate upon this article the delegate from Japan asked if the emoluments referred to were meant to be those awarded by the government of the captured or the captor ship, and urged that they should be those of the captor ship, but upon its being pointed out that in certain cases this would be nothing at all, it was agreed that it would be simpler and more just to assure to the captured staff its accustomed emoluments. In the conference of 1907, however, this was changed, and now the belligerent must guarantee "The same allowance and the same pay as are granted to the persons holding the same rank in their own navy."¹ In this matter of pay and emoluments only the staff of an official hospital ship is involved, "that of a relief society having no claim to receive a salary."

While the first paragraph of article 10 holds that the medical and religious staff are inviolable and can not be made prisoners of war, there is no just cause for complaint of the violation of the convention if in the execution of their duties members of the medical personnel or chaplains are accidentally killed or wounded; they are only protected from deliberate attack; and to obtain the privileges mentioned the personnel must be engaged exclusively in the care of the sick and wounded, or in the administration of medical units or establishments. (See Geneva Convention, arts. 6 and 9.)

Should the staff of these vessels, religious, medical, and hospital, be governed by the principles of the Geneva Convention, or should they be detailed for shore service (and this would also apply to the medical staff landed from a man-of-war), they should wear on the left arm an armlet or brassard bearing the Red Cross emblem, which should be delivered and stamped by competent authority. If any persons are attached to the medical service who do not have a military uniform, they shall have, in addition to the brassard, a certificate of identity. With respect to the latter, it may be stated that "no fixed form of certificate is prescribed. It may well happen that the use of certificates may lead to frauds unless there are marks on them by which the bearer can be recognized as the rightful owner. A certificate

¹ Art. 17. The Laws and Customs of War on Land states: "Officers taken prisoners shall receive the same pay as officers of corresponding rank in the country where they are detained; the amount shall be repaid by their government." (Fourth Convention, Hague Conference, 1907.)

without such mark of recognition must be carefully scrutinized and steps taken to verify the rights of the bearer to be in possession of it.
 * * * Efforts are being made to obtain some definite international understanding with regard to the details which should be noted on a certificate of identity."¹ This matter of a certificate of identity is of course of more importance to a medical organization on shore which may include civilian teamsters, cooks, etc., who wear no distinctive military uniform. (See arts. 19 and 20, Geneva Convention, 1906.)

If members of the medical personnel take part in a combat (and instances of their doing so have occurred, through excitement, or through a medical officer taking command in the absence or on account of the disablement of other officers) they should remove the Red Cross badge. Otherwise, if captured, their conduct may be the subject of inquiry as an abuse of this emblem under article 23 of the Fourth Hague Convention of 1907.² Permission to resume the badge is usually accorded if it is asked for.

Sick and wounded soldiers in a hospital ship are entitled to be treated by belligerents in accordance with the provisions of The Hague Convention, while sick and wounded sailors on shore fall under the Geneva Convention. This ruling is made plain from the following remarks of M. Renault, made before the Eighth International Red Cross Conference in London in 1907: "While there are two conventions dealing with the sick and the wounded, it must not be considered that one of them may only be applied to an army and the other to a navy. This would be in error."³

ARTICLE 11.

Sailors and soldiers and other persons officially attached to fleets or armies who are taken on board when sick or wounded, whatever their nationality, shall be respected and tended by the captors.

"Article 11 reproduces article 8 of the convention of 1899, with the additional words intended to bring under the shelter of inviolability not only wounded and sick sailors on board but also other persons officially attached to fleets or armies. Their addition is in harmony with article 1 of the Geneva Convention of 1906." (Higgins.)

The persons mentioned may be taken to be correspondents, Red Cross officers, foreign observers, etc.

¹ See "Notes on the Laws and Usages of War." Edmonds and MacPherson, Jr. R. A. M. C., September, 1909.

² ART. 23. * * * It is specially forbidden (*f*) to make improper use of a flag of truce * * * as well as the distinctive badges of the Geneva Convention. (Fourth Convention. Laws and Customs of War on Land.)

³ See p. 180. Archives de Médecine Navale, October, 1907. (M. Renault was the reporter of the committee which prepared The Hague Convention under discussion.)

ARTICLE 12.

Any warship belonging to a belligerent may demand the surrender of the wounded, sick, or shipwrecked who are on board military hospital ships, ships belonging to relief societies or to private individuals, merchant ships, yachts, and boats, whatever the nationality of such vessels.

With respect to the history and evolution of article 12, and the reasons determining its final adoption by the conference, I can not do better than quote the observations of Prof. Higgins and the remarks submitted in the general report on this convention. Higgins says, with reference to this article:

At the First Hague Peace Conference Capt. Mahan endeavored to obtain the insertion of articles to meet the case of men who by any accident connected with a naval engagement were picked up by a neutral vessel. The commander and some of the crew of the Confederate cruiser *Alabama*, after her last fight with the *Kearsarge* off Cherbourg, were picked up by the British yacht *Deerhound*, the captain of which claimed for the rescued seamen the inviolability of the neutral flag, and their surrender was refused. Capt. Mahan's proposal was that in such cases the neutral vessel must surrender the rescued persons if demand is made by the other belligerent, or, in case no demand was made, that they should not be allowed to serve again during the war. The attempt of the United States delegate was unsuccessful, and the convention of 1899 is silent on this point. Under the new article a belligerent cruiser meeting a hospital ship of any description, or a merchant ship, yacht, or boat of any nationality, may demand the surrender of the wounded, sick, or shipwrecked men on board.

The conclusions represented in the statement just quoted, which were supported by the German and French delegations, were at first combatted by the British delegation, but were finally acceded to by that delegation, with the reservation that the article should apply only in the case of combatants rescued during or after a naval engagement in which they have taken part, and would not apply, for instance, to rescues by British merchant ships at a distance from the scene of a naval engagement, as in the case of men from a ship which had been in a storm, or as a result of contact with a floating mine.

The general report contains the following comment on this article:

A belligerent cruiser meets a military hospital ship, a hospital ship, or a merchant ship; whatever be the nationality of these vessels, it has, either by virtue of article 4 of the convention or by virtue of the common law of nations, the right to visit them. It exercises it and finds on board shipwrecked, wounded, or sick; it has the right to have them delivered up to it, because they are its prisoners, as is stated in article 9 of the convention of 1899, reproduced in article 14 of our draft. This is only an application of a general principle, by virtue of which the combatants of one belligerent who fall into the power of the other are by that fact its prisoners. Obviously it will not always be to the interest of the belligerent to make use of this right. It will often be to his advantage to leave the wounded and sick where they are and not to take charge of them. But in such a case it will be indispensable not to allow wounded or sick to go free who are still in a condition to grant services

to their country; and this applies even more strongly in the case of shipwrecked men who are able-bodied. It has been said that it would be inhuman to force a neutral vessel to deliver up wounded which it had charitably picked up. To meet this objection it is only necessary to reflect on what would be the position in the absence of a convention. The positive law of nations would permit not only the seizure of individuals who are enemy combatants, found on board a neutral vessel, but the seizure and confiscation of the vessel for having rendered unneutral service. We may add that if the shipwrecked men were, for example, permitted to escape captivity by the sole fact that they had been taken on board a neutral vessel, the belligerent would disregard the philanthropic action of the neutral the moment such action might have the result of causing them an irreparable injury. Humanity would not be the gainer.

To continue with Prof. Higgins's remarks:

A strict application of the principles of neutrality would imply, apart from a convention, that belligerents taken on board neutral ships should not be allowed to take part again in hostilities during the course of the war; but the statement of M. Renault (in the general report just quoted) that the mere fact of picking up shipwrecked or wounded men would render a neutral merchant ship liable to seizure for unneutral service seems incapable of being substantiated as a rule of international law. * * * The solution of the difficulty provided by this article, is, however, one which may be justified by practical considerations. Among those on board a hospital or merchant ship may be found the brain of one of the belligerent navies, and "military necessity" might be appealed to as a justification for his removal. A belligerent would take the risk of complications with the neutral power. Moreover, the neutral captain might, from unforeseen circumstances, be unable to land the sick, wounded, or shipwrecked at a neutral port where they would be interned. Although a belligerent may, under this article, remove wounded, sick, or shipwrecked combatants, he can not change the course of a neutral merchant ship or impose any definite course on it; such orders can only be given to the commanders of hospital ships.

The observations of another English writer, Prof. Westlake, are especially lucid and illuminating on this article and may be quoted with benefit, as follows:

The argument of M. Renault was that in the absence of a convention international law would allow a belligerent not only to seize enemy combatants found on board a neutral vessel, but also to capture and confiscate the vessel as having rendered an unneutral service to the enemy; and that if shipwrecked combatants, for example, escaped captivity by finding refuge on board a neutral vessel, belligerents would fend off the charitable action of neutrals which threatened them with irreparable damage. * * * It is, however, scarcely the less necessary to form a judgment on this question of principle on which a difference of opinion between such authorities was expressed. To do so we must first remember one point on which the principles of neutral duty allow no controversy. If a neutral ship does not surrender to their enemy the combatants in a condition to fight again whom she has saved, she must carry them to her own country and they must there be interned. And this must equally be understood of those who may be expected to be again in a condition for fighting when their wounds have been healed. The real question is, therefore, whether the choice between the surrender and the internment

of the person concerned is to rest with the belligerent or the neutral. In favor of the neutral it may be urged that those who are under his flag at sea are constructively already in his country, and that their surrender can therefore no more be demanded than if they were physically in it. The belligerent may reply that the constructive identification of a ship with its country has not been admitted by the laws of war, as is proved by the right to take contraband goods and formerly enemy's goods from under the neutral flag; and that in the treaties stipulating the rule, "free ships, free goods," it is common to find it laid down that the freedom of the flag covers all persons on board except those in the enemy's military service. To this it must be added that the belligerents would insist upon with good warrant. But we can not argue that in private shipmaster to carry his passengers to a port where they will be safely interned, especially since the performance of that promise might be defeated by other causes than bad faith. The conclusion is that the reply is sufficient and that article 12 requires from a neutral no more than in its absence belligerents would insist upon with good warrant. But we can not argue that in the absence of the article a neutral shipmaster who had taken the persons in question on board would render his ship liable to confiscation for rendering unneutral service to the enemy. There would be no ground for presuming that he intended to restore them to the military service of their own side. If he had the correct intention to see to their safe internment, it is not clear what benefit the enemy would derive from internment being substituted for capture, and there would be no room for suggesting the existence of an improper arrangement between him and the enemy.¹

With reference to article 12, Prof. Lawrence, of the Royal Naval War College, has the following to say:

If neutral merchantmen, yachts, or boats rescue sick, wounded, or shipwrecked men, they can not be captured for having such persons on board, though they remain liable to seizure for ordinary violations of neutrality. A belligerent man-of-war may take these persons out of any hospital ship or any neutral yacht or merchantman which has rescued them, but not out of a neutral man-of-war. Those who have found asylum on board a vessel of the latter kind must be prevented from taking part again in the operations of war, which will generally mean in practice that they are interned in the neutral country. Internment might with advantage have been decreed for all who are rescued by neutrals. Under the convention those of them who are succored by private vessels will, if they are taken from the custody of their rescuers by a warship of their own side, be put back into the fighting line when fit for service; while on the other hand, if the vessel which demands them is an enemy, they will be made prisoners of war. Each fate seems inconsistent with the fundamental principle that no proceedings of neutrals should assist either side in a war. The British representatives at the conference opposed the action of Germany and France in pressing forward the solution we have ventured to criticize, but gave way at last to insure unanimity. The difficulty of restraining a victorious officer from seizing a beaten admiral found on board a neutral vessel and the possibility that a neutral ship laden with rescued men might not obtain permission to land them in the port of another neutral were the great arguments used in defense of the provisions of the convention as they stand.²

¹ Westlake, J., Prof. Intern. Law, Cambridge University. "International Law." Part II, p. 277.

² Lawrence, T. J., lecturer on international law at the Royal Naval War College. "International Problems and Hague Conferences." Dent & Co., London, 1908, p. 115.

ARTICLE 13.

If wounded, sick, or shipwrecked persons are taken on board a neutral warship, precaution must be taken as far as possible that they do not again take part in the operations of war.

This article covers the question of the disposition to be accorded those who may find asylum on board a neutral man-of-war. The convention of 1899 was silent upon this point, and during the Russo-Japanese War the Chemulpo incident raised this important question. At the outbreak of the Russo-Japanese War on the 8th of February, 1904, the captains of the British, French, and Italian cruisers at Chemulpo rescued or received the men of the Russian vessels *Korieta* and *Variag*, and refused to surrender them to the Japanese. Ultimately, after negotiation, the rescued sailors in the possession of the British authorities were, with the consent of the Japanese Government, handed over to the Russians at a neutral port. Article 13 now provides such persons so rescued are in the same position as that of combatants who take refuge in neutral territory. They are not to be given up to the adversary, but they should be detained by the neutral state so that they can not again take part in the military operations of the war. (See Takahashi, p. 462.)

ARTICLE 14.

The shipwrecked, wounded, or sick of one of the belligerents who fall into the power of the other belligerent are prisoners of war. The captor must decide, according to the circumstances, whether to keep them, send them to a port of his own country, to a neutral port, or even to an enemy port. In this last case prisoners thus repatriated can not serve again while the war lasts.

Article 14 reproduces article 9 of the convention of 1899 and requires no special observations other than those already made with reference to it. Amendments proposed to it by the German and Netherlands delegations were withdrawn when it was apparent that the amendments proposed were to be included in article 10 of the convention. The bearing of article 14 is largely determined by the provisions of article 12 preceding. It deals with the disposition of persons, ships being considered elsewhere. "As prisoners of war the sick and wounded have no privileges different from those of unwounded and healthy prisoners beyond that of proper medical attendance. In particular, they have no right to claim exchange or release because they are unfit for active military service. Exchanges or releases, however, may be made or sick or wounded may be handed over to a neutral State by mutual agreement between commanders." (See "Notes on the Laws and Usages of War," pp. 276-285.¹ See Art. 2, Geneva Convention, 1906.)

¹ "Notes on the Laws and Usages of War." Edmonds and Macpherson, Jr. Royal Army Med. Corps, September, 1909.

ARTICLE 15.

The shipwrecked, sick, or wounded who are landed at a neutral port with the consent of the local authorities must, unless an arrangement is made to the contrary between the neutral State and the belligerent States, be guarded by the neutral State so as to prevent their again taking part in the operations of the war.

The expenses of tending them in hospital and interning them shall be borne by the State to which the shipwrecked, sick, or wounded persons belong.

"Under this article where shipwrecked, wounded, or sick are landed at a neutral port with the consent of the naval authorities, they must, in default of arrangements to the contrary between the neutral and belligerent States, be guarded by the neutral State so as to prevent them from again taking part in the war. The expenses are to be borne by the State to which such persons belong." (Higgins.)

The general report states that if a neutral merchant vessel, having occasionally picked up wounded or sick or even shipwrecked persons, arrives at a neutral port without having met a cruiser or without having entered into any agreement, the persons which it lands do not fall under the provisions of this article; they are free.

ARTICLE 16.

After each engagement, the two belligerents shall, so far as military interests permit, take steps to search for the shipwrecked, sick, or wounded and to insure them, as also the dead, against pillage and maltreatment.

They shall see that the burial, whether by land or sea, or cremation of the dead shall be preceded by a careful examination of the corpses.

Article 16 is based on article 3 of the Geneva Convention. The provisions as to burial or cremation of the dead on land will apply to cases where engagements have taken place near land. There is, however, no obligation to bury or cremate the remains of the dead. Before the dead are buried or cremated they must be carefully examined to insure that life is extinct.

ARTICLE 17.

Each belligerent shall send, as early as possible, to the authorities of their country, navy, or army the military marks or documents of identity found on the dead and the description of the sick and wounded picked up by him.

The belligerents shall keep each other informed as to the internments and transfers, as well as to the admissions into hospitals and deaths, which have occurred among the sick and wounded in their hands. They shall collect all the objects of personal use, valuables, letters, etc., which are found in the captured ships or which have been left by the sick or wounded who died in hospital, in order to have them forwarded to the persons concerned by the authorities of their own country.

Article 17 reproduces the provisions of article 4 of the Geneva Convention. The military identification marks or tokens found on

the dead must be sent to the authorities of the army, navy, or country to which they belong as early as possible, the prisoners of war bureau being the proper channel of transmission. Likewise the articles of personal use, valuables, letters, etc., found on captured ships or left by wounded or sick who die on hospital ships must be collected and transmitted to the persons interested through the authorities of their own country.

The remaining articles of the convention call for no special observations other than those already made.

This convention was signed by all the powers represented at the conference except Nicaragua, and there were no reservations made to its provisions by any powers that might be regarded as seriously affecting its application in any war between signatory States. This convention had been ratified, up to August 2, 1910, by the following powers: Germany, United States, Austria, China, Denmark, Mexico, Netherlands, Haiti, Switzerland, and Russia. By that date it had not been ratified by Great Britain, France, or Japan. It may be stated, however, that ratification by these powers will probably be effected in due course of time, inasmuch as they have made no material reservations to its provisions, and it should be noted that they have all duly ratified the previous convention of 1899. In closing this paper I desire to quote the final paragraph of the general report on this convention, which report, I may state, was drawn up by a committee composed, in great majority, of naval officers: "Such is the project which we submit for your approval, in preparing which we have been guided by the previous conventions of 1899 and 1906. We do not consider it to be less beneficial than those conventions, and we think that the transformation of the project into a diplomatic convention should make for a real advance toward the codification of the law of nations."

APPENDIX.

EXTRACTS FROM THE KING'S REGULATIONS AND ADMIRALTY INSTRUCTIONS, 1906, AND ADDENDA, 1908, RELATING TO FIRST-AID INSTRUCTION. (DUTIES OF MEDICAL OFFICERS.)

ART. 1292. (Sec. III, Chap. XXXV.)

2. He (i. e., the surgeon in charge) is to arrange for the instruction of the under-mentioned officers and men in the principles of first aid to the injured, and is responsible that the necessary appliances for use by those instructed are readily available in those parts of the ship where they will be needed in action :

All officers of the nonmilitary branch.

Midshipmen.

Naval cadets.

Master at arms and ship's police.

Light Q. F. and machine guns' crews not utilized in a ship's action.

Coxswains and bowmen of boats.

Markers of companies and field guns.

Noncommissioned officers of the Royal Marines not stationed at guns, and Royal Marine Band ranks.

Writers, ship's stewards, cooks, officers' stewards and cooks, and other day-men, including band ratings (old system).

A proportion of engine-room artificers, mechanicians, chief stokers, stoker petty officers, and leading stokers who are to be given special instruction in the treatment of burns and scalds, and the removal of wounded from the bunkers, stoke holds, and engine room.

3. Officers and men detailed to assist the medical staff in action and afterwards are, in addition to first aid, to be given instructions in some of the simple nursing rules.

4. Officers qualified in first aid are to be given a certificate, and in the case of men the fact is to be noted in their service certificates.

EXTRACT FROM GERMAN REGULATIONS GOVERNING FIRST-AID ORGANIZATION. (MAR. 4, 1908, REPLYING TO OFFICE OF NAVAL INTELLIGENCE, NO. 8937, JAN. 27, 1908.)

* * * * *

Besides the sick carriers, however, all men, as far as possible, but especially the gun crews and other men employed on upper decks, * * * are instructed in the principles of the careful transportation of the wounded and rendering first aid. For this purpose they are divided into groups, and successively, at certain periods, are turned over for instruction to the sanitary officers until their training is complete.

* * * * *

In general, in peace time battleships and large cruisers have on board two sanitary officers and three sanitary men. * * * In war an additional medical assistant is assigned.

* * * * *

The number of sick carriers for ships of a complement of more than 600 men is at least 16 men. * * * Their rating is that of seamen or leading seamen. As regards the selection of these men, it is required that, if possible, one-half of them be professional seamen. Ammunition men, cooks, waiters, buglers, men of the administration personnel, etc., who during intervals of action or after action is over, are indispensable at other points, should not be detailed as sick carriers.

CARRYING THE WOUNDED (JAPANESE NAVY).

It is the practice of the Japanese Navy during time of peace to divide the ship's complement into two parties for instruction in first aid and ambulance work.

The first division comprises clerks, riggers, servants, and fire-brigade men (also the bandmen on board the flagship), and receives instruction from the ship's surgeons in bandaging wounds, prevention and stopping of bleeding, and carrying of wounded men, for several hours per week. These men, therefore, are well qualified assistants in the work of tending the wounded with first aid. The second division consists of the remainder of the crew, and receives instruction as time and opportunity allow.

(Notes on experiences during the Russo-Japanese Naval War, 1904-5, Surg. Gen. Shigemichi Suzuki, Imperial Japanese Navy (fleet surgeon in Mikasa), Jr. Assoc. Mil. Surgeons, Nov., 1905.)

EXTRACT FROM MINISTERIAL CIRCULAR (FRENCH) OF MARCH 1, 1906, RELATING TO STRETCHER BEARER PERSONNEL. (ARCH. DE MÉD. NAV., JUIN, 1906, P. 474.)

* * * The men designated * * * if they prove apt in fulfilling their duties as stretcher bearers * * * a supplementary mark will be assigned them. * * * These marks will be inscribed on the enlistment records of those affected. Upon transfer to another ship, such men will be chosen by preference to form a part of the first-aid party.

EXTRACT FROM "FLEET REGULATIONS, UNITED STATES ATLANTIC FLEET, MAY 8, 1910."

ART. 176. (a) Commanding officers will require that daily instruction be given by medical officers to the men, when circumstances permit it to be done, in the first aid to the wounded, resuscitation of the drowned, and also in hygiene and sanitation, pointing out briefly to the men their duty to the ship in maintaining absolute cleanliness; the necessity of keeping their persons and clothes clean, and the danger of venereal diseases, not only to themselves but to their shipmates; how to avoid cholera, dysentery, etc.; in fact, all subjects that will tend to preserve health and maintain them in good physical condition. A regular program for such instruction should be arranged so that too great a number of men shall not be under instruction at the same time, and so that all members of the crew will receive instruction. Such instruction shall be considered as a regular drill.

(b) Independently of the provisions of paragraph (a), officers of gun divisions will be instructed in the use of aseptic dressings and first-aid measures; and they will give a few minutes' instruction at least once a week to the gun crews. Persons stationed in turrets and isolated compartments are cut off from surgical assistance not only in battle but to a serious extent during drills, and in the event of injury are dependent upon their immediate comrades. In order to more fully provide for possible emergencies, packages of first-aid dressings will be kept at all times in turrets, handling rooms, and other not easily accessible compartments where men are stationed for battle or battle exercises.

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A STUDY OF 3,268 VENEREAL PROPHYLACTIC TREATMENTS.

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The 3,268 treatments for the prevention of venereal disease were given between May 1, 1910, and August 31, 1911. They are considered to be a fair index of the results of venereal prophylaxis.

Soon after the *Delaware* went into commission the following order was drawn up and published:

ORDER.

All men returning from liberty, except during the night, will report to the sick bay as soon as they have been checked in by the officer of the deck.

The medical officer will have a copy of the liberty list and will check names of the men who report.

Men who return on board during the night after 9 p. m. will report to the sick bay before 7 a. m.

Men returning under the influence of liquor will be sent to the sick bay in charge of a messenger.

This order was in force for 10 months and was found ineffective for the following reasons:

1. Men who reported with venereal disease frequently insisted that they had taken the prophylactic treatment, when there was no record to substantiate their statement.

2. Men would evade the questions asked them by the apprentices giving the treatment, and if disease developed would seek to shift the blame upon them.

3. It rested with the Medical Department to detect the men exposed, and made it necessary to go over a liberty list of from 300 to 400 men each morning.

In order to correct some of these faults the following order was prepared.

NOTICE.

1. On account of the necessarily close contact of people on board ship, and the consequent necessity of keeping everything clean and wholesome, the following order will be strictly carried out.

2. Infection by venereal disease may be done in many ways totally unexpected, so that it is the absolute duty of any man who is unfortunately so infected to use every means in his power to restore himself to health, not only a duty to himself but a duty to the whole ship's company.

ORDER.

3. Hereafter only men who have exposed themselves to venereal infection will be required to report to the sick bay upon returning from liberty. All men who have had intercourse with a woman will consider themselves as having been exposed to infection and will report to the sick bay at once to take the prophylactic treatment.

4. The prophylactic treatment will only be taken under the supervision of a hospital apprentice, who will instruct the men in the proper method of taking it, and keep the record of the treatment.

5. Men taking the treatment will see that their names are properly entered and will initial the entry, as a failure to do this will be regarded as disobedience of orders; the entry being the only evidence which will be accepted that the order has been obeyed.

6. Men in the crew will for their own protection and protection of their shipmates report to their division officer any evidence they may have of concealed venereal disease on board ship.

7. Any man who neglects to take the prophylactic treatment will be punished for disobedience.

8. Any man guilty of concealing a disease will be proceeded against as in article 946, United States Navy Regulations, and brought before a court.

The effect of this order was at once apparent. The percentage of men taking the treatment at once doubled, but this was also probably due to the few liberties possible in a month during the cruise around South America. In this connection it may be stated that the men, at least some of them, seem to think that it is not necessary to take the

treatment in home ports, while they are careful to take it in foreign ports.

It will be noted that the number of prophylactic treatments and percentages of disease increased with the foreign cruises.

Estimations made by the medical staff and hospital corps have placed the probable average percentage of men who expose themselves and in spite of the order do not take the prophylactic at from 5 to 50 per cent. This is a large number, the smaller being the probable figure for foreign ports and the latter figure for the home ports.

In conjunction with the above order instruction has been given the crew (a) by lectures, (b) by literature.

The plan which has been pursued has been as follows: (a) Have each divisional officer distribute a copy of Bureau of Medicine and Surgery Confidential Circular No. 1 to each of his men.

(b) A few days later the medical officer takes a section of men and explains the full meaning of each paragraph in the circular. At the same time to each man who requested it a copy of the American Medical Association's pamphlet, "The Boy's Venereal Peril," was given.

The educational plan was carried still further. Should a man become infected he was given a copy of Confidential Circular Nos. 2, 3, or 4, according as his disease was gonorrhea, chancroid, or syphilis.

These circulars are a great help in putting clearly and forcibly before the patient the measures he must take to prevent accidental infection of his shipmates and at the same time helps him to realize the gravity of his disease and the necessity of prompt and careful treatment.

Each man's name, when admitted with a venereal disease, was entered on a card, with the following data, and the card filed away for reference:

Name.....	Rate.....
Diagnosis.....	Date.....
Joined ship.....	
Date took prophylactic.....	
Number of hours after exposure.....	
Number of attack.....	
Place and length of liberty.....	
Period of incubation of disease.....	
Sequelæ.....	
Date discharged.....	Where.....

Table I will show the percentage of men going on liberty who took the treatment, and the infections for each disease, based on who did and who did not take the treatment.

TABLE I.

[Last pay number, 1338.]

	1910						
	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average complement, Delaware.....	563	799	799	799	822	822	822
Total number of liberties for month.....	4,122	2,253	1,222	285	6,574	1,549	2,259
Total number reporting for prophylactic.....	101	46	67	28	276	78	446
Not reporting.....	4,021	2,186	1,155	257	6,798	1,471	1,813
Percentage taking prophylactic.....	2.42	2.06	5.40	9.92	4.19	5.03	19.65
Percentage not taking prophylactic.....	97.58	97.94	94.60	90.08	95.81	94.97	80.35
Total infections syphilis.....	2	1	1			1	
Total infections syphilis taking prophylactic.....							
Total infections syphilis not taking prophylactic.....	2	1	1			1	
Total infections chancreoid.....	6	3	3		4		3
Total infections chancreoid taking prophylactic.....							
Total infections chancreoid not taking prophylactic.....	6	3	3		4		3
Total infections gonorrhea.....	13	14	4	1	10	7	20
Total primary infections gonorrhea.....	12	7	2	1	5	5	9
Total primary infections gonorrhea not taking prophylactic.....	12	7	1	1	5	2	4
Total primary infections gonorrhea taking prophylactic.....			1			2	5
Total infections gonorrhea primary and recurring taking prophylactic.....	1		2	1		3	7

	1911							
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
Average complement, Delaware.....	927	927	927	927	880	880	913	
Total number of liberties for month.....	2,564	693	661	906	5,158	1,679	1,232	1,630
Total number reporting for prophylactic.....	314	281	363	248	267	248	150	212
Not reporting.....	2,250	412	298	656	4,891	1,431	1,082	1,418
Percentage taking prophylactic.....	12.73	40.54	59.90	27.36	5.17	14.77	12.17	13.00
Percentage not taking prophylactic.....	97.27	59.46	40.10	72.64	94.83	85.23	87.83	86.99
Total infections syphilis.....	3		3	1			3	
Total infections syphilis taking prophylactic.....			2				1	
Total infections syphilis not taking prophylactic.....	3		1	1			2	
Total infections chancreoid.....	4	3	10	12	3	4	3	3
Total infections chancreoid taking prophylactic.....	3	3	8	13		4	2	2
Total infections chancreoid not taking prophylactic.....	1		2		3		1	1
Total infections gonorrhea.....	7	15	10	4	9	10	16	10
Total primary infections gonorrhea.....	4	6	3	1	5	6	10	3
Total primary infections gonorrhea not taking prophylactic.....	3	2	2		4	4	4	1
Total primary infections gonorrhea taking prophylactic.....	1	4	1	1	1	2	6	2
Total infections gonorrhea primary and recurring taking prophylactic.....	2	11	6	4	5	6	10	6

Localities visited:

Norfolk, Va.	June, 1910
Norfolk; St. Thomas, Danish West Indies; Newport, R. I.	July, 1910
Boston; Newport; Norfolk.	Aug., 1910
Norfolk.	Sept., 1910
Norfolk; Wilmington; New York.	Oct., 1910
Weymouth, England (4 days' leave in London).	Nov., 1910
Cherbourg, France (4 days' leave in Paris).	Dec., 1910
Norfolk.	Jan., 1911
Rio de Janeiro, Brazil.	Feb., 1911
Santiago, Chile.	Mar., 1911
Rio de Janeiro; Boston.	Apr., 1911
New York.	May, 1911
New York; Portsmouth, England.	June, 1911
Boston, Provincetown, Mass.	July, 1911
Boston, from Salem and Rockport.	Aug., 1911

Two apprentices are detailed to give the treatment. One takes the record and the other supervises the taking of the treatment.

Three stands are arranged, one for each stage of the treatment.

The treatment is as follows:

1. Wash penis, head, shank, and under frenum with 1-5,000 bichloride of mercury solution with a cotton sponge.

2. Pass water. Take urethral injection of 2 per cent protargol solution and hold to count 60.

3. Rub 50 per cent calomel ointment well into foreskin, head, and shank of penis, with particular care about the frenum.

Either side of the frenum is the most frequent site of sores.

Table II is compiled to show the number of cases taking prophylactic for a given hour after exposure.

Treatment taken within 8 hours after exposure in 1,385 cases shows 19 infections, or but 1.37 per cent. In the interval of from 8 to 12 hours after exposure in 741 cases shows 25 infections, or 3.31 per cent. Between 12 and 24 hours in 920 cases shows 46 infections, or 5 per cent.

TABLE II.

Hours after exposure.	Men taking prophylactic.	Infections in each disease.		
		Chan-croid.	Gonor-rhea.	Syphilis.
1	13			
2	69			
3	128		1	
4	165	2	1	
5	112	1		
6	237	2	1	
7	75		2	
8	586	2	7	
9	58		3	
10	332	2	4	
11	35		2	1
12	316	4	9	
13	29	1	1	
14	123	4	4	
15	145		4	
16	127		3	
17	32	1	1	
18	165	4	3	
19	47	3	2	
20	113	1	1	
21	6	2	2	
22	22	2	2	
23	6	1		
24	112	1	4	
25	2			
26	3			
27	11			
28	1			
29	1			
30	5			
32	1			
33	1			
36	15			
40	13			
42	1		1	
44	1			
48	78		4	
50	6			
52	3			
56	1			
61	1			
65	1			
72	39	1	2	
81	1			
96	19	1		
100	12			
120	2			
124	2			
164	1			
240	1			

NOTES TO ACCOMPANY TABLE II.

Of the 56 cases of gonorrhea occurring in the first 24-hour interval, 26 were recurrent cases; the remaining 30 were primary infections.

There were 1,385 exposures in which the treatment was taken within the first 8 hours, and among these men there were 19 infections, or 1.37 per cent.

There were 731 exposures in which the treatment was taken in the interval of 8 to 12 hours after exposure, and among these men there were 25 infections, or 3.41 per cent.

There were 920 exposures in which the treatment was taken in the interval of 12 to 24 hours after exposure, and among these men there were 46 infections, or 5 per cent.

In the first instance 1 man out of every 72.9 contracted an infection; in the second period 1 man out of every 30.2; in the third instance 1 man out of every 20.

Since compiling the above table, and to include the months of September and October, the total number of prophylactic treatments have increased from 3,268 to 3,624, with the following results: 1 to 8 hour period, 1,415 treatments gave 20 infections, 1.41 per cent, or 1 man in 70; 8 to 12 hour period, 892 gave 27 infections, 3.26 per cent, or 1 man in 30; 12 to 24 hour period, 968 gave 48 infections, or 1 man in 20.

Gonorrhea was the most frequent disease contracted and had 62 infections to its credit. It is interesting to note the period of incubation in some of these cases. Undoubtedly all cases with an incubation period of over 10 days should be thrown out, as there is probably a question of veracity on the part of the man, who to escape punishment, refers his exposure to the last time he took the prophylactic treatment. There are 9 who come in this class. We have not excluded them in our statistics, but leave the reader to judge.

There are several factors that should be taken into consideration with regard to the statistics of the prophylaxis of this disease.

A large percentage of the men returning from liberty come on board under the influence of intoxicants, and as a consequence are careless in taking the treatment. Some of the men, who have sensitive urethras, complain of pain on taking the injection. Needless to say, under these conditions the full benefit is not obtained.

A résumé of all the gonorrhea cases can be consulted below.

No. -	Date reporting with gonorrhea.	Date took prophylactic.	Hours after exposure.	Attack.	Period of incubation.	Sequelæ.	Date pronounced cured.	Total days sick.	Total days incapacitated.
					<i>Days.</i>				
1....	Aug. 18, 1910	Aug. 14, 1910	8	First...	4		Sept. 25, 1911	42	
2....	June 29, 1911	June 26, 1911	8	do....	2				
3....	July 20, 1911	July 16, 1911	8	do....	4		July 25, 1911	5	
4....	July 21, 1911	July 12, 1911	8	do....	9				
5....	Dec. 19, 1910	Dec. 10, 1910	8	do....	9	Myalgia acuta.	May 29, 1911	161	5
6....	June 7, 1911	May 26, 1911	9	do....	11				
7....	July 12, 1910	May 14, 1910	10	do....	28		Sept. 25, 1911	75	
8....	Feb. 12, 1911	Jan. 27, 1911	11	do....	15	Arthritis gonorrhoea.	Mar. 14, 1911	60	6
9....	Aug. 12, 1911	Aug. 6, 1911	11	do....	7				
10....	Jan. 31, 1911	Jan. 24, 1911	12	do....	7		Mar. 3, 1911	31	
11....	Feb. 3, 1911	Jan. 25, 1911	12	do....	8		May 1, 1911	86	
12 ¹	Feb. 22, 1911	Feb. 19, 1911	12	do....	3	Adenitis inguinal.	Apr. 26, 1911	73	15
13....	May 4, 1911	May 1, 1911	12	do....	3		June 12, 1911	39	
14....	July 26, 1911	July 22, 1911	12	do....	4				
15....	July 3, 1911	June 29, 1911	13	do....	4	Epididymitis.			13
16....	July 24, 1911	July 15, 1911	14	do....	9				
17....	Apr. 7, 1911	Apr. 5, 1911	14	do....	1		May 2, 1911	26	
18....	Feb. 24, 1911	Feb. 18, 1911	15	do....	6		Apr. 20, 1911	55	
19....	July 6, 1911	June 27, 1911	16	do....	10				
20....	Aug. 16, 1910	Aug. 14, 1910	18	do....	2		Oct. 10, 1910	55	
21....	Mar. 22, 1911	Mar. 17, 1911	19	do....	4		May 30, 1911	69	
22....	Feb. 21, 1911	Feb. 19, 1911	20	do....	3		Apr. 24, 1911	62	
23....	Aug. 18, 1911	Aug. 6, 1911	21	do....	10				
24....	June 21, 1910	June 20, 1910	24	do....	1		Aug. 10, 1910	50	
25....	Nov. 30, 1910	Nov. 25, 1910	24	do....	5	Epididymitis.	Jan. 11, 1911	41	5
26....	Dec. 29, 1910	Dec. 22, 1910	24	do....	6		Apr. 25, 1911	127	
27....	Nov. 29, 1910	Oct. 7, 1910	48	do....	52				
28....	Nov. 30, 1910	Nov. 26, 1910	48	do....	5	Phimosis.	May 13, 1911	164	36
29....	Dec. 24, 1910	Dec. 18, 1910	48	do....	6				
30....	May 16, 1911	May 12, 1911	72	do....	7		June 18, 1911	33	
31....	Mar. 3, 1911	Feb. 19, 1911	3	Second.	11		Apr. 8, 1911	35	
32....	June 29, 1911	June 21, 1911	8	do....	7				
33....	May 23, 1911	May 16, 1911	9	do....	6				
34....	Jan. 28, 1911	Jan. 19, 1911	9	do....	10		Feb. 27, 1911	30	
35....	May 28, 1911	May 24, 1911	10	do....	4	Epididymitis.	June 21, 1911	24	10
36....	Feb. 19, 1911	Feb. 18, 1911	10	do....	1		Apr. 5, 1911	46	
37....	Dec. 27, 1910	Dec. 12, 1910	10	do....	15	Myalgia acuta; arthritis gonorrhoea; cystitis.	Feb. 17, 1911	51	164
38....	Dec. 30, 1910	Dec. 18, 1910	12	do....	12		Apr. 26, 1911	116	
39....	Feb. 23, 1911	Feb. 19, 1911	12	do....	3		June 20, 1911	117	
40....	Feb. 1, 1911	Jan. 24, 1911	14	do....	6	Epididymitis.	Mar. 28, 1911	55	6
41....	Feb. 21, 1911	Feb. 19, 1911	15	do....	2		May 8, 1911	76	
42....	Apr. 11, 1911	Apr. 6, 1911	15	do....	5		June 5, 1911	55	
43....	Aug. 11, 1911	Aug. 6, 1911	16	do....	6		Sept. 17, 1911		
44....	Apr. 8, 1911	Apr. 5, 1911	16	do....	2		Apr. 24, 1911	18	
45....	May 18, 1911	May 7, 1911	17	do....	10				
46....	Mar. 17, 1911	Mar. 14, 1911	18	do....	3		May 12, 1911		
47....	Aug. 24, 1911	Aug. 19, 1911	18	do....	6	Cystitis.			
48 ²	Apr. 9, 1911	Apr. 6, 1911	19	do....	3	Adenitis inguinal.			14
49....	Mar. 21, 1911	Mar. 16, 1911	21	do....	4				
50....	Dec. 30, 1910	Dec. 26, 1910	48	do....	3		Mar. 14, 1911	74	
51....	Dec. 19, 1910	Dec. 7, 1910	72	do....	12		Jan. 18, 1911	30	
52....	Feb. 8, 1911	Jan. 26, 1911	6	Third.	11		May 1, 1911	81	
53....	July 18, 1911	July 14, 1911	7	do....	4	Cystitis.			
54....	do	July 12, 1911	12	do....	6				
55....	June 5, 1911	May 29, 1911	12	do....	6				
56....	June 30, 1911	June 26, 1911	14	do....	3				
57....	June 29, 1911	June 21, 1911	15	do....	8				
58....	Feb. 22, 1911	Feb. 19, 1911	22	do....	3		Apr. 13, 1911	50	
59....	Mar. 16, 1911	Mar. 14, 1911	7	Fourth.	2		May 2, 1911	47	
60....	Mar. 20, 1911	Mar. 15, 1911	24	do....	4	Rheumatism, articular, chronic.	May 18, 1911	59	2
61....	Aug. 26, 1911	Aug. 20, 1911	42	do....	2		Aug. 8, 1911		
62....	July 18, 1911	July 13, 1911	8	Fifth.	5				
63....	July 20, 1911	July 14, 1911	4	Sixth.	6				

¹ Hospital.

² Transferred to hospital.

Chancroid gave 35 infections. The average period of incubation was 13.26 days. We think it quite probable that in chancroids, to a much greater extent than gonorrhea, there is a question of the veracity of the man who seeks to escape restriction and punishment. A striking number of these cases appeared directly after the ship had sailed, when there was no prospect of liberty for some time to come.

No.—	Date reporting with chancroid.	Date took prophylactic.	Number of hours after exposure.	Period of incubation.	Sequelæ.	Date pronounced cured.	Total days under treatment.	Total days incapacitated.
				<i>Days.</i>				
1.....	Feb. 11, 1911	Jan. 20, 1911	4	20		Mar. 8, 1911	25	
2.....	Apr. 14, 1911	Apr. 6, 1911	4	7		Apr. 25, 1911	11	
3.....	Mar. 16, 1911	Feb. 18, 1911	5	26		Apr. 3, 1911	18	
4.....	June 4, 1911	May 9, 1911	6	24		June 21, 1911	17	
5.....	June 21, 1911	June 21, 1911	6	5		July 21, 1911	24	
6.....	Jan. 31, 1911	Jan. 19, 1911	8	11	Lymphadenitis.....	May 1, 1911	79	10
7.....	June 9, 1911	May 21, 1911	8	18		July 14, 1911	35	
8.....	July 3, 1911	June 23, 1911	10	10				
9.....	June 4, 1911	June 1, 1911	10	3	Adenitis inguinal.....			29
10.....	Feb. 17, 1911	Jan. 22, 1911	12	25		Apr. 29, 1911	40	
11.....	Mar. 9, 1911	Feb. 18, 1911	12	18		Apr. 24, 1911	45	
12.....	Apr. 14, 1911	Apr. 5, 1911	12	8		May 20, 1911	36	
13.....	do.	do.	12	8		Apr. 25, 1911	11	
14.....	Apr. 11, 1911	do.	13	4		May 11, 1911	30	
15 ¹	Mar. 8, 1911	Feb. 18, 1911	14	17	Adenitis inguinal.....	May 6, 1911	59	24
16.....	Apr. 1, 1911	Mar. 16, 1911	14	15	do.	do.	30	23
17.....	Mar. 27, 1911	Mar. 17, 1911	14	9	do.	Apr. 30, 1911	34	20
18.....	July 28, 1911	July 16, 1911	14	12	do.			
19.....	Jan. 27, 1911	Jan. 20, 1911	17	7	do.	Apr. 21, 1911		55
20.....	Mar. 22, 1911	Mar. 16, 1911	18	5		Mar. 30, 1911	8	
21.....	Apr. 8, 1911	Apr. 5, 1911	18	2		Apr. 17, 1911	11	
22.....	Aug. 25, 1911	Aug. 5, 1911	18	20				
23.....	Apr. 18, 1911	Mar. 14, 1911	18	33	Adenitis inguinal.....	May 12, 1911	24	8
24.....	Aug. 13, 1911	Aug. 6, 1911	19	2	do.			
25.....	Mar. 30, 1911	Mar. 16, 1911	19	13	do.	May 16, 1911	47	41
26.....	Apr. 10, 1911	Mar. 17, 1911	19	22	do.	Apr. 26, 1911	16	12
27.....	do.	Apr. 6, 1911	20	3	do.	June 20, 1911	71	27
28.....	Apr. 11, 1911	Apr. 5, 1911	21	5	do.	June 18, 1911	68	7
29.....	Apr. 12, 1911	Apr. 6, 1911	21	5		May 19, 1911	32	
30 ¹	Mar. 28, 1911	Mar. 17, 1911	22	10	Adenitis inguinal.....	Apr. 26, 1911	29	22
31 ¹	do.	do.	23	10	Rheumatism.....	do.	29	16
32 ¹	June 13, 1910	May 16, 1910	24	38		June 21, 1910	8	8
33.....	Apr. 19, 1911	Apr. 9, 1911	24	9		July 7, 1911	72	
34.....	Jan. 27, 1911	Dec. 16, 1910	72	42		Apr. 3, 1911	65	
35.....	Feb. 5, 1911	Dec. 22, 1910	96	42	Adenitis inguinal.....	Apr. 25, 1911	79	46

¹ Hospital.

Average incubation period, 14.72 days.

Syphilis is remarkably low. Only three cases taking the treatment contracted the disease and they were all over the eight-hour interval.

No.—	Date reporting with chancre.	Date took prophylactic.	Hours after exposure.	Period of incubation.	Sequelæ.	Date pronounced cured.	Total days under treatment.	Total days incapacitated.
				<i>Days.</i>				
1.....	July 13, 1911	June 21, 1911	11	20	Syphilis July 31.....			9
2.....	Mar. 19, 1911	Feb. 18, 1911	22	28	Adenitis inguinal.....	Apr. 5, 1911	17	18
3.....	Mar. 24, 1911	Dec. 23, 1910	96			Apr. 22, 1911	29	

With reference to the effectiveness of the treatment we would say that we feel reasonably certain that at least one-half of the men exposed present themselves for treatment.

On this basis if 3,258 exposures took treatment we liberally estimate that 3,258 did not take treatment.

In this case the results would be as follows:

	Infections among those who took pro- phylactic.	Infections among those who did not take pro- phylactic.
	<i>Per cent.</i>	<i>Per cent.</i>
Syphilis.....	0.092	0.306
Gonorrhea.....	1.964	2.424
Chancroid.....	1.074	.859
Chancroid (with incubation period less than 20 days).....	.767	1.197

From our experience we believe that where a "K" package or other prophylactic package is issued to be taken ashore by the men very few would apply for it. Should a man then contract venereal disease there is no way of checking back to see if he really took the treatment or simply said that he had done so to escape the consequences of disobeying an order.

The degree to which compulsory prophylaxis may be carried is limited. Should a man deliberately refuse to take the treatment after exposure, the treatment could not be forced upon him without bringing up the question of assault. The only course then open would be to quarantine him aboard ship for the incubation period of the disease. No man has ever refused to take the prophylactic treatment on board this ship.

Ignorance, intoxication, indifference, and a prolonged period between exposure and treatment are perhaps the most prominent reasons for failure in the treatment, but even with these factors we are strongly convinced of the value of venereal prophylaxis.

A YEAR'S EXPERIENCE IN VENEREAL PROPHYLAXIS ON BOARD THE U. S. S. "GEORGIA," JULY 1, 1910-JUNE 30, 1911.

By Passed Asst. Surg. C. L. MORAN, United States Navy.

Compulsory venereal prophylaxis as authorized by a circular letter of the commander in chief to the commanding officers of the Atlantic Fleet, dated May 22, 1910, has now been enforced on board the U. S. S. *Georgia* for over a year and a brief survey of the results is, I think, worthy of your consideration.

The following table shows the general trend of venereal diseases on this ship during the past two years and a half:

	Com- ple- ment.	Admis- sion rate per 1,000 for pri- mary ve- nereal in- fections.	Remarks.
Calendar year 1909.....	819	174.60	About average rate for large cruising ships, prophylaxis not fairly started.
July 1, 1909, to June 30, 1910.	895	122.91	Analyzed by quarters below. Infections conscientiously admitted; but many under complications rather than as primary infections.
July 1, 1910, to June 30, 1911.	909	171.62	Analyzed by quarters below. All known infection faithfully admitted and under the original infection rather than para-mount complications.
Third quarter, 1909.....	885	63.27	Cape Cod Bay and southern drill grounds.
Fourth quarter, 1909.....	888	198.19	54 days Philadelphia; 12 Norfolk.
First quarter, 1910.....	915	87.43	Guantanamo Bay.
Second quarter, 1910.....	891	133.54	63 days Philadelphia.
Third quarter, 1910.....	930	202.47	In home ports, chiefly Philadelphia (which had highest vene-real rate for 1909).
Fourth quarter, 1910....	956	200.12	Cruise in Europe, Brest and Gravesend. Many on furlough; no timely prophylaxis.
First quarter, 1911.....	926	64.79	Largely at Guantanamo and at sea; some cases followed expo-sure abroad.
Second quarter, 1911....	825	92.01	In home ports, Boston and Provincetown; many furloughs.

Fiscal year 1909-10 without prophylaxis: Complement, 895; primary venereal admissions, 110—chan-croid 17, gonorrhea 70, syphilis 23.

Fiscal year 1910-11 with prophylaxis: Complement, 909; primary venereal admissions 157—chan-croid 38, gonorrhea 103, syphilis 16.

At first sight, on looking over these figures, the results seem rather disconcerting, but on closer observation there is much with which we may feel well satisfied. The admission rate for syphilis has been appreciably reduced, and surely this disease is the most dreadful of all venereal infection.

Rate per 1,000 for 1909-10 (July to July) 25.60

Rate per 1,000 for 1910-11 (July to July) 17.59

In 2,878 treatments following admitted exposure there has not been a single case of syphilis develop throughout the whole year. Certainly this is more than mere coincidence, as there were during the same period 16 admissions for syphilis among those who failed to take prophylactic treatment. Concerning the higher admission rate during the past year with prophylaxis in vogue, we have the important factor of the great prominence given to this subject of late, in contrast to previous years, causing the utmost diligence in hunting down and recording every case, no matter how slight. Again, the trip abroad, with its many furloughs, afforded unusual opportunities for sexual indulgence.

In general, the nature of the cases occurring after treatment was decidedly mild, complications uncommon, and the response to treat-ment prompt. While abroad men on furloughs who admitted expo-sure were required to take treatment on return, not with the view that the treatment would be effective, but rather to preserve uni-formity and to prevent any confusion.

I have neglected purposely to go into the method of procedure; it is so well known throughout the Government services. It is the routine treatment prescribed of an anterior injection of 2 per cent protargol, preceded by a bichloride wash and the vigorous local application of 40 per cent calomel ointment, to be left in contact. The work has been in charge of a reliable hospital apprentice, first class. The commanding officer has rendered every assistance, so that now it is the exceptional man who does not, on his return from liberty, come at once to the sick bay to be checked in. In case the subject acknowledges exposure, he is sent to the crew's head, where all treatments are given, and again checked in by a hospital apprentice. With this double-check system it is very difficult for any man, having acknowledged exposure, to avoid or neglect treatment.

In the fiscal year 1910-11 of 157 admissions for primary venereal infections only 31 were in 1911. That is, the large majority were in the third and fourth quarters of 1910 when prophylaxis was being established, and of these 31 cases only 12 occurred when treatment had been taken. In the second quarter of 1911 there were 19 admissions—5 chancroid, 13 gonorrhea, and 1 syphilis. In April there were 1,305 liberties, 311 treatments, 4 admissions, none of whom had taken treatment. In May there were 2,006 liberties, 276 treatments, 9 admissions, 5 of which were after treatment. In June there were 1,736 liberties, 179 treatments, with 6 admissions, 2 of which were after treatment.

Undoubtedly the percentage of failures after treatment is too high, in the vast majority of cases, because it is administered too late to be effective, and the only solution would seem to be the prophylactic package, already employed in some foreign countries and in our own Army. The use of the latter presupposes sobriety, as there is no hospital apprentice present to supervise each treatment.

Since completion of this paper the returns for the month of July are at hand and appended.

July, 1911, 3,361 liberties, 521 treatments, 6 admissions, only 1 of which had taken treatment.

THE RECENT ADVANCES IN THE PROPHYLAXIS AND TREATMENT OF TYPHOID FEVER.¹

By Passed Asst. Surg. MORTON W. BAKER, United States Navy.

The subject matter of enteric fever occupies one of the widest fields in the whole range of medicine; second only in importance to syphilis and tuberculosis. The disease itself is probably coeval with civilized man, for wherever bodies of men have gathered together there it has

¹ Read before the Naval Medical Society, New York City.

been found. That it has been engaging the attention of the medical mind even from the earliest dawn of our profession, we learn from the writings of Hippocrates, who speaks of a low continued fever, with emaciation, tympany, and death. It is a point of historical interest that the disease itself was not separated and differentiated as a distinct clinical entity until about the middle of the last century—to be exact, 1842. Although before this time much had been written on this and closely allied fevers. The disease itself then, as now, was so insidious and protean in its manifestations, and so complex in its symptomatology, that it seems completely to have eluded those accurate old observers.

Yet, as the phenomena of the disease in many cases are so clear cut, it is not a little surprising that these older physicians—with their wonderful clinical acumen and trained powers of observation, which taught them those thousands of precious truths learned, not in libraries or laboratories, but at the bedside—it is surprising, we say, that they failed for so long to grasp and comprehend its true significance. Could any description be more typical of a perforation than the following one sentence, written in the quaint old English of a medical man, who pondered deeply on this subject nearly 300 years ago: "Pains and torments cruelly infected his belly, that crying out and moaning night and day, he sent forth most heavy complaints, his hypochondria and abdomen were tumid like a tympany and mightily distended."

This disease has for years continued to breathe its pestilence, and to-day in our country alone claims between 45,000 and 50,000 deaths per annum. This means, at a conservative estimate, between 450,000 and 500,000 cases which recover. Surely, it will repay us to look over the field again, and garner any new facts which will aid in the solution of this stupendous problem.

I propose to discuss the subject under two heads: First, the prevention and control of the disease by antityphoid vaccination; second, the treatment of typhoid fever by inoculation.

Prevention and control.—Here rests the physician's greatest responsibility and task. Since the disease never arrives *de novo*, every case means an infection from a previous one. It has been appositely said: "Nature is careful of the type, but careless of the single life." Now, if we undertake to reverse nature's methods in this or any other respect, we must pay heavy tribute. Some, with commendable zeal, will devote the most painstaking care and solicitude to an individual case, yet appear heedless or oblivious of the great link in the chain by which a hundred others may become infected. Often the chain is in the hands of ignorant underlings, whom the busy practitioners, with absorbing cases, can not possibly supervise personally. And it is just here that modern medicine, ever mindful that prevention is a brighter

jewel in her crown than the most marvelous cures, steps in with her arresting hand. In reviewing the recent bibliography of this subject at the Academy of Medicine, I have been amazed at the vast array of literature from almost every civilized country along this line, showing its supreme importance and the attention it is receiving from scientific minds to-day. And well it may, for a glance at the mortality and morbidity of recent wars, bears its own melancholy testimony. During the Spanish-American War there were nearly 21,000 cases and about 1,600 deaths, most of these having never left this country—86½ per cent of the entire mortality of this war. In the South African War there were 31,118 cases and nearly 6,000 deaths. So that the laconic saying that an army has chiefly two foes, “bullets and bacilli,” seems entirely justified, with the first prize to the bacilli.

It was a realization of these tragic consequences that gave an added impetus to its study, and we believe to-day that the problem has been largely solved. The procedure of the prevention of typhoid fever by inoculation is very simple, but, like all the great advances of medicine, the result of patient and painstaking toil, and at first encountering disheartening and discouraging results. To Wright, of England, belongs the greatest honors, though there have been many other coworkers in the same field. It was first tried on a large scale during the Boer War, but the reports from its use were so at variance and the views of the profession so skeptical that it fell temporarily into disuse, if not actual disfavor. I remember discussing the phase of the question with some British surgeons during a visit to Cape Town on the flagship *Brooklyn* soon after the South African campaigns. They did not seem enthusiastic or even favorably impressed with its use, and therefore the more credit is due its advocates for triumphing finally in the face of apparent disaster.

The material used is a true vaccine in the proper and correct acceptance of this term, and the condition produced one of active artificial immunity. As early as 1892 it was demonstrated that in the production of this immunity it was not essential to use the living organism, but that dead cultures were equally as effective, since the immunizing substance was an integral part of the body of the bacillus, i. e., intracellular. So far as is known at present, we have the same antibodies produced as the result of inoculation as are produced during an attack of clinical typhoid, and the amount of agglutinins, bacteriolysins, and opsonins seem to be even greater after vaccination than after a clinical case, and therefore it is not unreasonable to expect that the immunity so conferred will last for a considerable period. (Russell.) The vaccine is prepared by growing the bacillus either on bouillon or, preferably now, agar. The typhoid bacillus, while a facultative anærobe, grows better with an abundance of oxy-

gen, and therefore with agar it is possible to obtain many times more than the number to be gotten from the same quantities of broth.

The organisms are grown for 48 hours at 37° C., and then killed by heating in a water bath at 53° C., for one hour. The emulsion is then standardized to give uniform dosage, and diluted with physiological salt solution until 1 cubic centimeter contains 1,000,000,000 bacilli, to which is added one-fourth of 1 per cent of carbolic acid, lysol, or trikresol, and then sealed in glass ampules. It is interesting to note that while the virulent strains give, of course, a much more pronounced reaction, the older and nonvirulent strain gives a higher degree of immunity. In order to secure the most beneficial results, it has been found that at least three injections should be made at intervals of about 10 days. Almost any part of the body with an abundance of subcutaneous tissue may be used for the seat of inoculation, but the best sites are the upper arm at the insertion of the deltoid, or over the tensor vaginæ femoris. There seems to be some divergence of opinion as to the tissues of the body into which bacterial vaccines should be inoculated in order to produce the quickest and highest immunizing response. Though it is still a disputed point as to what particular cells or tissues of the body take part in the formation of antibodies, there are practically only two situations where bacterial vaccines can be conveniently given in the case of man, viz, either subcutaneously or into the muscles, and it is important to know which of these two localities is better situated to our purpose. Semple, of the Royal Army Corps, in a recent article in the *Lancet*, after a series of extensive experiments along this line, says: "The intramuscular method possesses no advantage whatever over the subcutaneous method, and as the latter gives rise to less pain and inconvenience, it is to be preferred." The recent introduction of the iodine method of sterilizing the skin makes this procedure exceedingly simple and expeditious, as it dispenses with the old method of scrubbing with soap and water, alcohol, and various germicidal reagents. By this method I am unable to find the report of a single abscess or localized infection. It is preferable to give the inoculation late in the afternoon, so that if there is any pronounced reaction, which is rare, the patient can lie down, and is usually entirely normal by the next day. Sometimes there is some reaction, manifested by headache, malaise, nausea, and slight elevation of temperature, but these are unusual and quite transitory, contrasting markedly with some of the intense reactions we see following the administration of "606." While one inoculation may and oftentimes does immunize, the second is more certain, and a third most certain. The first dosage is 500,000,000 bacilli, or one-half cubic centimeter, and the second and third twice this amount,

containing each 1,000,000,000 bacilli or 1 cubic centimeter. If we examine the serum of an individual who has thus been immunized, we find that there is a large increase in both the agglutinating and bacteriacidal elements of the blood.

The Widal reaction is positive in high dilutions, in some cases found present in 1 to 20,000. Repeated examinations would show a gradual return to the normal, varying from 6 to 12 months, so that just how long this artificially induced immunity would last under conditions of actual exposure and infection is still *subjudice*. It should be remembered that the "Widal reaction is worthless as a means of diagnosis among vaccinated men, since it persists for many months following inoculation and blood cultures should invariably be taken in such cases." This part of the subject can not be dismissed without reference to the so-called negative phase. In no less renowned authority than Osler's *Modern System of Medicine* we find the following unequivocal statement: "The immediate effect of the vaccination is to diminish the resistance to infection. It is evident that it would not be wise to vaccinate during an epidemic, as the procedure apparently makes the individual less resistant to infection for a while." One hesitates to controvert such unquestioned authority, but science is making such strides to-day that what was apparently correct yesterday is out of date to-morrow, so that the most recent investigators now claim that there is no negative phase, and if so, it is so trifling as to be negligible. However interesting these theoretical details, the value of preventive inoculation has been demonstrated beyond any peradventure in thousands upon thousands of practical cases. One of our medical officers, who was on duty recently with a large detachment of marines in Cuba for several months, has reported to me that there was but one case of typhoid during all their stay there, and that this case was probably an outside infection. While I have been unable as yet to secure definite statistics from the recent Army maneuvers in Texas, where over 20,000 troops were mobilized, I have learned indirectly that the number of cases was practically *nil*. Contrast this with the Spanish War statistics, already given, and it will be obvious that the need of further argument is useless. So convinced am I of its efficacy and value that I would strongly advocate its being made compulsory in both arms of our service. In it we have a potent weapon for good, and it is our confident belief that time and experience will justify us in hazarding the statement that it will become one of the crowning triumphs of modern medicine.

II. We now proceed to a consideration of the second feature of this paper, namely, the treatment of the disease itself by inoculation.

As an inevitable and logical corollary of the above, the question would at once suggest itself to the alert mind: If the artificial injec-

tion gives rise to such a conspicuous increase in the antibodies, which are identical in nature with those produced during a clinical attack, why not use this method for the developed attack? From a theoretical standpoint this reasoning is eminently logical and correct so far as it goes, and unquestionably it is along the right lines. The following is the deficient link—the therapeutic rock, as it were, whereon theoretical considerations and clinical experience have collided: It is well demonstrated that after the usual prophylactic inoculation, it requires from 7 to 10 days before there is a sufficient response from the tissues to give any appreciable increase in the bacteriolysms and other antibodies. After this time, as stated, there is an enormous and conspicuous immediate response. Now, assume that we have a clinical case of typhoid, in whom we propose to use this method of treatment. The disease must necessarily have already progressed several days before we can arrive at a sure and accurate diagnosis. Thereupon the vaccine is at once injected. Another week must elapse before the tissue cells in response thereto can align their forces and begin the attack. And during this week, with perhaps another added before, what changes may occur, what complications arise! Were the response after the infection immediate, the battle would be won and the disease have lost its terror. The question at once suggests itself: If an immediate effect is desired, why not give intravenous instead of subcutaneous inoculations? But the problem is not so easy, and Wright himself says that for the production of immunizing agents the subcutaneous method is more efficient than the intravenous. So that the truth is forced upon us that nature requires time to work out her subtle and delicate processes, and seems to resent any efforts on our part to hurry her or force the issue. Even as it is, the reports from many cases and many observers are most encouraging. Callison, of New York, in a recent excellent monograph on this subject, which should not only be read but studied by every medical man, speaks of its value in no uncertain terms, among other things saying: "This treatment takes a process of nature which is running riot and converts it into a controlled and efficient process." He reports a collection of 323 cases, in whom, with the exception of 2 cases moribund at the time of injection, there was a mortality of only 4.6 per cent. A British Army surgeon sends this report from distant India: "The typhoid facies was conspicuous by its absence. There has been an unusual absence of prolonged cases, of complications, of sequelæ, and relapses. Moreover, no bad results have been so far noted." Many more instances of similar purport could be cited, even more favorable and enthusiastic, from those who have given this method of treatment a faithful and impartial trial. The technique of its administration is quite similar to the one already mentioned, except a somewhat smaller initial dosage, say of 300,000,000,

as soon as the diagnosis is made, to be repeated every third or fourth day, increasing each dose by 100,000,000 until the full dose of 1,000,000,000 is given. It is to be distinctly emphasized, however, that this method of procedure should in no way supersede the regular and recognized treatment of the disease. At present it is only ancillary. In typhoid fever there is the possibility always of certain conditions and complications arising, despite all treatment and despite all medicaments. And in this affection, perhaps more than in any other, the physician's sound and skillful judgment and guiding hand are worth more than all the drugs in the *Pharmacopœia*. A word must be said in regard to the serum therapy of typhoid. Chantmesse, of Paris, reports a series of 1,000 cases treated with typhoid serum with a mortality of 4.9 per cent, while the death rate in other parts of the same city from the routine treatment was 17 per cent. This serum is prepared in a manner somewhat similar to that of diphtheria antitoxin, by the injection of horses with a virulent strain extending over a period of many months. From 5 to 10 minims of this serum is injected, and then can be repeated after a week or more if the symptoms indicate. While this method unquestionably seems to have features in its favor and is worthy of more extended study, we believe that the true solution of the problem lies not in serum therapy, which can give at most only a passive immunity, but in the vaccine method of treatment, which gives an active immunity and one that is more or less permanent and lasting.

In conclusion, a discussion of this subject seems profitable, not only by reason of its own inherent interest and importance, but also still further to indicate the direction and strides our profession is making to-day. I believe that we are standing on the brink of a mighty therapeutic upheaval. The modern conception, based on reason and science, that each infection must be combated, not by drugs, but by its own specific serum, antitoxin, or vaccine, sounds the keynote of revolution and opens up fields of infinite possibilities.

U. S. NAVAL MEDICAL SCHOOL LABORATORIES.

THE NAVAL MEDICAL SCHOOL COLLECTIONS.

By Passed Asst. Surg. P. E. GARRISON, United States Navy.

During the year ending October 1, 1911, about 425 specimens have been added to the permanent collections of the school. Of these additions, 175 are pathological, 136 helminthological, and the remainder miscellaneous, consisting for the most part of tropical material including protozoa, mosquitoes, flies, fleas, lice, ticks, tarantulas, scorpions, and venomous snakes. The pathological and helminthological material has been catalogued as it has been received and the additions have been published in the bulletin. The miscellaneous specimens have been properly preserved and their receipt acknowledged, but sufficient material of any one kind has not been received to justify establishing a separate catalogue, and it seems advisable, for the present at least, to keep together all material, except pathological and helminthological specimens, as a miscellaneous collection. By far the greater part of the material has been sent in by the medical officers of the service. Some very valuable specimens have been received from outside sources. Only those specimens are placed in the permanent collections which present features of special interest or value.

Determinations.—Many specimens come in with requests for determination or diagnosis. Reports upon these are made as promptly as practicable by officers on duty at the school. Should there be any reason for doubt, or, in the case of zoological specimens should the opinion of a zoological specialist be desirable, the specimens are referred to special authorities, and this course has been taken several times during the past year. The determination of a specimen may require a very considerable amount of study, and it should be borne in mind that some time may be required before a report can be made. Where the delay promises to be excessive an explanatory letter is written.

In some cases it is not clear whether a special report is desired upon a specimen or whether it is simply sent as a deposit for preservation in the collection. It is advisable, therefore, to state on the label in every case either "Report desired" or "For deposit."

Information concerning specimens.—Too often the information accompanying a specimen is insufficient. Its source, the date of collection, method of preservation, locality, and notes on the case are all points which add interest to the specimen and may be of very great help or even essential in making an intelligent diagnosis.

Material desired.—From time to time during the year reports have come to the school of material thrown away under the impression that it was too plentiful to be of museum value. The collections of the school have not an overabundance of any material, and when it is considered that there is a constant depletion both by classroom work and by supplying requests from outside it is questionable whether it will ever be a case of oversupply, even with the more common specimens. As a matter of fact, it is often the common material which it is difficult to have sent in, and it is a striking fact in this connection that the National Museum has difficulty in securing a plentiful supply of a species so common as *Ascaris lumbricoides*. Another fact frequently lost sight of, but of special importance to naval medical officers, is the geographical distribution of diseases and of parasites. The question of the occurrence of certain forms in different parts of the world can be satisfactorily determined only by actual comparison of specimens collected in different localities. This applies to parasitic animals and to diseases in which there is a pathologic or bacteriologic basis for comparison.

Using the collections.—While the collections are intended primarily for the use of the school for purposes of instruction, they are gradually developing a secondary usefulness in supplying material to officers of the service for purposes of study or for comparison with other material which they have found in their local work. The difficulties of making determinations in more or less isolated localities, without adequate literature, are very great, and the opportunity of comparing specimens with material already determined from other localities adds much to the possibility and reliability of such work. The material available at the school for this purpose is as yet limited, but it is hoped this sphere of usefulness can be enlarged. If specimens continue to be deposited as they have in the past year, it is probable that the collections of the school will soon be able to furnish material covering a wide range of subjects.

To a limited extent the school laboratories are able to cooperate further by supplying sections, photographs, or drawings of material for officers who have not the facilities for doing this work. All such work must, of course, be secondary to the demands upon the laboratory force by the regular work of the school, and can be done only at the discretion of the commanding officer.

Preserving and forwarding specimens.—It is desired to amend the instructions for killing and preserving parasitic worms¹ by another method, which has been tested by Medical Inspector E. R. Stitt, which appears to offer several advantages over the hot alcohol or bichloride methods, especially under conditions which frequently exist in the Naval Service. This is a method of Langeron, as given in Braun and Lühe.

The worms, when collected, are placed in a 5 per cent solution of formalin (formaldehyde, 2 per cent), in which they should remain from 1 to 24 hours, according to the thickness of the specimen. They are then transferred to a preserving fluid, prepared as follows:

Glycerine	2
Distilled water	1
Phenol (crystals)	1
Lactic acid	1

For the first transfer from the formalin solution this lacto-phenol should be diluted with an equal part of water. Later the specimens may be placed in the full-strength solution. The advantages of the method appear to be that there is no shrinkage or distortion of the specimen, and it remains soft and pliable if not subjected too long to formalin; it clears the specimens satisfactorily for ordinary determinative work (especially nematodes); it can be used for both round worms and flat worms, thus doing away with the necessity of preparing more than one killing solution; it is nonalcoholic and is therefore amenable to the postal law, and permits mailing of specimens without transfer to a special mailing fluid.

It is emphasized that the worms must not remain in formalin longer than is necessary for complete fixation of the tissue, and never over 24 hours.

When the specimens are to be stained or sectioned, the preserving fluid should be removed by first diluting the fluid and then washing for several hours in water.

Mailing cases have been sent out to the hospitals and various ships and stations, and have been replaced by others as fast as sent in. Requests for mailing cases or for special jars or mailing boxes for forwarding specimens will be promptly complied with.

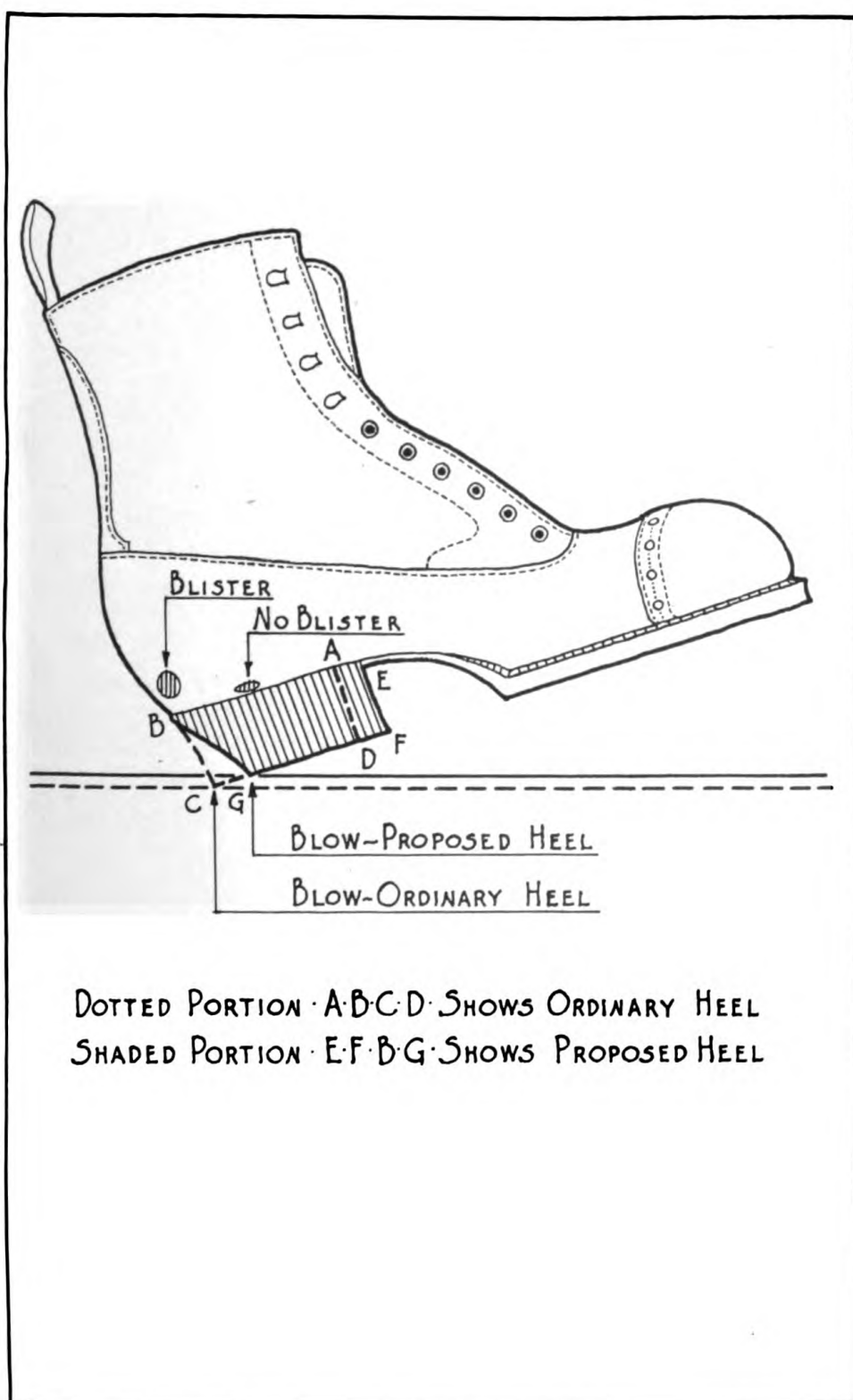
¹ This Bulletin, Vol. IV, Nos. 3 and 4, July and October, 1910.

Additions to the helminthological collection, United States Naval Medical School, September–November, 1911.

Accession No.	Name.	Host.	Collected by or received from—
19787	<i>Porocephalus</i> (adults).....	Python (lung).....	E. R. Stitt, Naval Hospital, Canacao, P. I.
19788	<i>Porocephalus</i> (ova).....	do.....	Do.
19789	Parasitic worms.....	Python (stomach).....	Do.
19790	do.....	do.....	Do.
19791	<i>Dibothriocephalus</i> (ova).....	<i>Felis domestica</i>	Do.
19792	Nematodes.....	Monkey (intestine).....	Do.
19793	Flukes.....	<i>Bos taurus</i> (liver).....	Do.
19794	Tapeworms.....	Goat (intestine).....	Do.
19795	<i>Dibothriocephalus</i> (ova).....	<i>Felis domestica</i>	Do.
19796	Filaria.....	<i>Otomela lucionarcis</i>	Do.
19797	<i>Dibothriocephalus</i> (adults).....	Iguana.....	Do.
19798	<i>Paragonimus westermani</i>	Homo.....	Do.
19799	<i>Paragonimus</i>	<i>Penelopes manillae</i>	Do.
19800	Ova of <i>Oxyuris vermic</i>	Homo.....	W. M. Kerr, naval station, Guam.
19801	Fly larva.....	Homo (nasal cavity).....	E. W. Phillips, U. S. S. Paducah.
19802	Filaria.....	Mynah bird.....	E. R. Stitt, Canacao.
19803	Nematodes.....	do.....	Do.
19804	do.....	Frog (intestines).....	Do.
19805	<i>Hymenolepis</i> and ova.....	Shrew (feces).....	Do.
19806	<i>Hymenolepis</i>	do.....	Do.
19807	<i>Dibothriocephalus</i>	<i>Felis domestica</i>	Do.
19808	Nematodes.....	<i>Mus decumanus</i>	Do.
19809	<i>Ascaris lumbricoides</i>	Homo.....	W. M. Kerr, Guam.
19810	<i>Balantidium coli</i> , and <i>Trichuris trichiura</i>	Homo (sigmoid flexure).....	F. E. Sellers, Guam.
19811	<i>Ascaris lumbricoides</i> (in appendix).....	Homo.....	W. M. Kerr, Guam.
19812	do.....	do.....	Do.
19813	<i>Ascaris lumbricoides</i> (in pancreas).....	do.....	Do.
19814	Nematodes.....	Fish.....	J. A. B. Sinclair, Sitka, Alaska.
19815	Ova of <i>Taenia saginata</i>	do.....	E. R. Stitt, Naval Medical School, Washington, D. C.

Additions to the pathological collection, United States Naval Medical School, September–November, 1911.

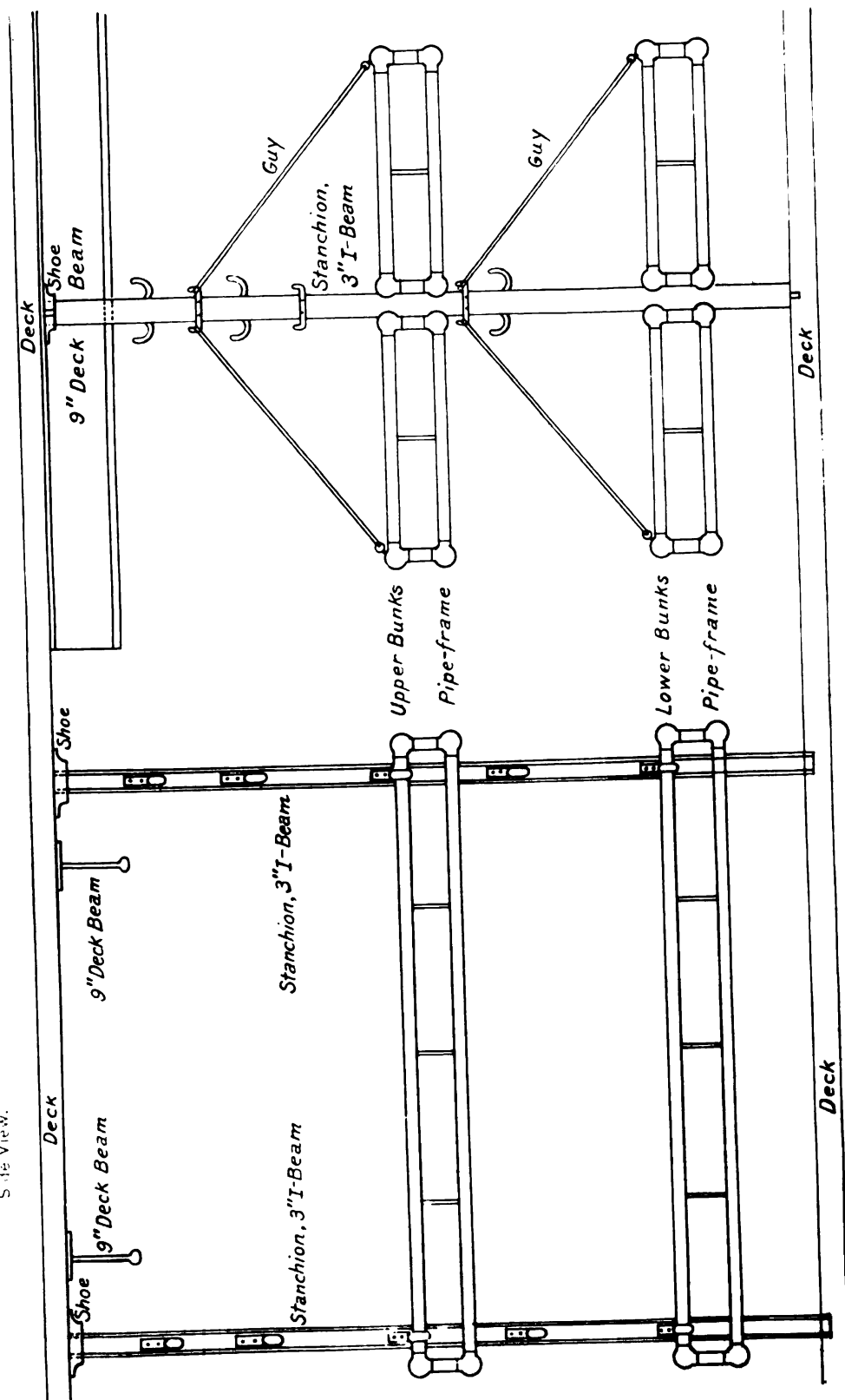
Accession No.	Tissue.	Diagnosis.	Collected by or received from—
598	Nodule from chin.....	Ulcer.....	C. K. Winn, Naval Hospital, New York, N. Y.
599	Nodule from foot.....	Indolent ulcer.....	Do.
600	Nodule, testicle.....	Con. tis. increase.....	N. J. Blackwood, Naval Hospital, New York.
601	Venereal sore from prepuce.....	No treponema demonstrated (Levaditi).....	J. J. Snyder, U. S. S. Michigan.
602	Appendix.....	do.....	C. M. Oman, Naval Hospital, New York, N. Y.
603	Large intestine.....	Perforating ulcer.....	R. Spear, Naval Hospital, Washington, D. C.
604	Tumor of pancreas.....	S. R. cell sarcoma.....	W. S. Pugh, Naval Hospital, Chelsea, Mass.
605	Tumor from lower lip.....	Epithelioma.....	C. M. Oman, Naval Hospital, New York, N. Y.
606	Lung.....	Plague.....	G. B. Crow, Naval Hospital, Philadelphia, Pa.
607	Liver.....	Schistosomiasis.....	Do.
608	Colon.....	<i>Balantidium coli</i>	E. R. Stitt, Naval Medical School, Washington, D. C.
609	Appendix.....	Perforated appendix, with general peritonitis.....	R. C. Holcomb, U. S. S. Delaware.
610	do.....	Gangrenous appendicitis.....	Do.
611	do.....	do.....	Do.
612	Eye.....	do.....	W. M. Kerr, Guam.
613	Intestine.....	Amebiasis.....	Do.
614	Uterus.....	Hydatid mole.....	Do.
615	Embryo.....	do.....	Do.
616	Heart.....	Miliary tuberculosis.....	Do.
617	Abdominal tumor.....	do.....	Do.



DOTTED PORTION · A·B·C·D · SHOWS ORDINARY HEEL
 SHADED PORTION · E·F·B·G · SHOWS PROPOSED HEEL

A NEW HEEL FOR WALKING SHOES.

End View.



AN IMPROVED COT FOR HOSPITAL SHIPS AND SICK BAYS.

SUGGESTED DEVICES.

Capt. W. S. Sims, United States Navy, has suggested a device which seems to be of considerable value, especially to those officers who suffer from painful blisters on the heel as a result of the physical exercise.

In an ordinary shoe the point of impact is at the edge of the heel, and the blow is transmitted to the heel at the insertion of the tendo achilles. A blister frequently results and is painful to the pedestrian. In this shoe the point of impact is near the middle of the heel, and the blow is felt in the forward or middle part of the heel, where the skin is thick.

By referring to the diagram it is seen that in a shoe with the ordinary heel (A, B, C, D), the point of impact is at (C), the main force of the blow being transmitted to the point of the heel, where a blister frequently forms. This blister is commonly present when the shoe fits too tightly, or when a wrinkle in the stocking occurs at this point. In the new shoe heel (E, F, G, B), the point of impact is (G), the force of the blow being transmitted to the ball of the heel, and no blister is formed.

Capt. Sims says: "I have been using this kind of a heel on a pair of walking shoes for about three years. It is designed to get rid of the blow at (C), where it often makes a blister in the skin of the heel. The new heel transfers the force of the blow from (G) to the ball of the heel, and never makes a blister. This is especially recommended for heavy men with small feet."

A piece of rubber to replace the removed portion of the heel would no doubt increase the comfort and add to the appearance of the shoe. (*See illustration opposite page 72.*)

AN IMPROVED COT FOR HOSPITAL SHIPS AND SICK BAYS ABOARD SHIP.

By Surg. E. M. BLACKWELL, United States Navy.

This cot is a modification of the one now used aboard ships of the Navy. It consists of an ordinary pipe-frame cot, $6\frac{1}{2}$ feet long by $2\frac{1}{2}$ feet wide by 8 inches deep. The bottom is made of jointed wire, attached to the sides as well as to the ends by spiral-steel springs, to prevent undue sagging, which is a bad feature of the present cot in

use. It is entirely separate and distinct from the rest of the parts and can be unshipped at will and used as a litter.

For setting up the cot two stout stanchions, consisting of 3-inch I beams, $5\frac{1}{2}$ feet apart, are necessary to support it. These stanchions have hooks on the sides for 4 cots, 2 upper and 2 lower, and extra hooks for raising or lowering the bunks to any desired height, or for placing them at the top out of the way, giving a free open space below. The upper pipe of the frame at each end of the cot rests in the hooks, and the lower pipe rests against the stanchions, keeping the cot horizontal. Guy ropes or chains are attached to the end and caught by loops over hooks on the stanchions. This gives additional strength and support to the cot. The lower ends of the stanchions fit into metal mortises on deck, and the upper ends into metal shoes fastened to the deck above. The cot can be easily detached, the stanchions unshipped, and the whole stowed elsewhere.

The advantages of this cot in wards aboard a hospital ship or in a sick bay are very manifest and apparent. It can be attached to any bulkhead by attaching the proper hooks thereto. Owing to lack of space, wards aboard ship are necessarily crowded with cots. At times all of them are occupied, but generally not more than half of them are filled, and at such times it would add greatly to the comfort of the patients and convenience of the attendants if the unused cots could be placed out of the way and not shut out light and interfere with ventilation. When the upper cot is not in use it can be placed out of the way on the hooks at the top of the stanchions, and the lower cot can be raised to any desired level for the examination, care, and treatment of the patient. If necessary, the opposite bunk can be unshipped and removed and the patient approached from both sides and both ends. The cots can be folded up against the stanchions, but this is not so desirable as placing them on the upper hooks out of the way. If it is desired to move a patient to a different ward, or to another part of the same ward, he can be carried in his bunk as a litter without the unavoidable inconvenience and discomfort caused by transferring him first to a stretcher and then to another cot. At times it would be very desirable to remove some sections of cots from a ward to give space for various purposes. It would also facilitate the cleaning of wards and cots, and keeping them more sanitary, if the cots could be moved.

These cots are light and of simple construction, and can be easily handled and kept clean and sanitary. The accompanying blue print fully demonstrates the construction and mechanism of the cot.

CLINICAL NOTES.

UMBILICAL HERNIA.

By Surgeon H. F. STRINE, United States Navy.

Umbilical hernia sounds commonplace; however, this is the subject, directing attention to a not uncommon condition which is seldom recognized in the service. Umbilical hernia here refers to small protrusions through slitlike openings in the umbilicus. There is no noticeable tumor and the distress is rarely referred to the actual point of trouble. Unless palpated for they are not found.

That these hernias are rarely recognized is evinced by the fact that prior to December last I never saw one diagnosed. That they are frequently overlooked in civilian life is the statement of one of the leading surgeons of Europe. They can not be considered rare, as the following records have been made since November, 1910, and all from patients in the United States Naval Hospital at Norfolk, Va.

In one of the large clinics of Berlin last October, a man 40 years old was presented before a class in physical diagnosis. He had been under treatment for about two years in different hospitals for chronic gastritis. Pain in the stomach, most severe after full meals and relieved by vomiting, was the principal feature of the case. Blood was noticed on several occasions in the vomitus. He was referred to the above surgical clinic for gastro-enterostomy. Each of us reviewed the history, made an examination, and missed the diagnosis. It was a small umbilical hernia. Stress was laid on the fact that this condition was usually overlooked. That such severe symptoms with practically nothing pointing to the seat of trouble could be produced by apparently so insignificant a hernia, made quite an impression and we decided to look for umbilical hernias.

Case I. C. G. F., seaman, United States Navy. Convalescent from extensive burns involving the chest. He complained of pain and tenderness in the region of the duodenum, most severe after eating and during the night. Vomiting gave relief. Ulcer of the duodenum was suggested. He had lost weight, was neurasthenic, and evidently suffering. Palpation revealed a slitlike opening in the umbilicus which was quite sensitive to finger-tip pressure. The hernial protrusion could be plainly felt as it slipped back into the abdominal cavity. The abdominal wall was repaired and he was discharged to duty, cured.

Case II. R. I. K., ordinary seaman, United States Navy. This patient complained of long-standing epigastric pain, most severe in the morning when

getting out of bed and after bending over, as in the act of tying his shoes. No vomiting. On palpation the same condition as in Case I was found. He suffered from advanced cardiac disease with failing compensation. An adhesive strap with small pad pressure gave him relief. Operative treatment was not thought to be advisable and he was invalided from the service.

Case III. A. C. H., fireman, first class, United States Navy. As serving to emphasize the importance of a careful, systematized routine examination before considering a patient to be a malingerer, and at the same time showing how deceptive general appearances may be, the following case has taught me a valuable lesson. A sick-bay habitué, with no apparent sign of organic disease, was considered a malingerer, and he looked the part. Fortunately, definite proof is required to convict in such cases. The easiest solution to the problem was to send him to the hospital and a harmless little varicocele was taken advantage of for a diagnosis. His constant complaint was pain in the back, and he would not work. The general opinion about the ward was that he was trying to effect his discharge from the service. Such was my report, and he was ordered confined to the ward. Thus he continued until one day he stated that the pain was girdle like, beginning at the umbilicus and settling in his back. It was another umbilical hernia. Operative treatment gave relief and while convalescing he proved a satisfactory ward cleaner.

Case IV. G., an officer, United States Navy, aged 56. Following a sudden strain, a "giving away" sensation was felt at the umbilicus. This officer has suffered from recurrent inguinal hernia and, as he states, was on the lookout for rupture. He discovered the opening, felt the small protrusion, and suspected the nature of the injury. A small pressure pad is constantly worn and he experiences no inconvenience.

Case V. S. T. M., ship's fitter, first class, United States Navy. He was a syphilitic with spasmodic pain in the upper epigastrium and region of the gall bladder. There was a history of jaundice on two occasions. Two intravenous injections of Salvarsan were given and the luetic manifestations disappeared; also the jaundice. But the pain continued, and was quite severe at times. He was a gallstone suspect. The upper half of both recti muscles were guarded and tender on pressure. Another case of umbilical hernia. Syphilis explained the jaundice. Operation was followed by relief from symptoms.

Case VI. W. D. P., coal passer, United States Navy. Admitted and readmitted to the sick list with hepatic congestion. After five weeks of observation and treatment he did not improve and with the above diagnosis he was transferred to this hospital. Patient states that since childhood he has suffered from attacks of pain, located in the upper part of the abdomen and region of his liver. Examination of the abdomen was negative except for tenderness on pressure along the linea alba above the umbilicus and a small umbilical hernia. A truss relieves the pain and he is awaiting operative treatment.

The remaining cases are not umbilical hernias. In a way they do not belong to this article, since both presented noticeable tumors. They are epigastric hernias of the linea alba; however, both were admitted to the hospital with long-standing complaint and the true nature of each had not been suspected. Another reason for presenting these cases in spite of the fact that they presented irreducible tumors will appear later.

Case VII. R. E. R., water tender, United States Navy. Considered a case of persistent recurring fireroom cramps. Epigastric pains, with nausea and vomiting; very severe at times. Attacks usually associated with lifting and fireroom work. A small visible sensitive tumor 2 inches below the ensiform cartilage.

Case VIII. W. J. S., chief electrician, United States Navy. This man has been under observation and treatment in the service for more than six years. In 1906 he was a patient of mine in the New York hospital with chronic gastritis. He was discharged to duty after three months with definite dietary instructions. His last readmission with chronic gastric catarrh was August 2, 1911. Since 1906 he has suffered constantly from gastric distress. Several months ago he noticed a small increasing tumor, about 2 inches above the umbilicus, extremely sensitive to pressure. August 10, 1911, he was admitted to this hospital with a diagnosis of cyst. The condition was epigastric hernia from the beginning. In the New York hospital in 1906 this hernia resembled those that have been described under umbilical hernia, no appreciable tumor in the thick layer of abdominal fat, a small slit-like opening in the linea alba, and a small sac. An increase of extra-peritoneal fat, characteristic of these hernias, occurred, and the patient became aware of a "lump." The same small sac, with the same firm-rimmed little defect in the abdominal wall, pinching the stomach wall as it escaped, existed when I saw him five years ago; but ventral hernia never entered my mind. Operative treatment gave relief in both cases.

The last two cases are typically described by the following extract from Bryant and Buck, *System of Surgery*, Volume VII, *Epigastric Hernia*: "In the upper abdomen the hernias of the linea alba are a type by themselves, having a peculiar history and requiring operative cure. They are aptly called epigastric hernias. They appear in the median line, about 3 inches above the naval, as globular sacs, often buried in the superficial fat, so as to be detected only by palpation. When irreducible they give no impulse and are easily mistaken for small lipomas. In general, small globular masses in this location may be looked upon with some degree of suspicion, especially if they are accompanied by deep pain or digestive trouble. In some instances they contain not only omentum but also small segments of the wall of the small intestine, the colon, or stomach, and they cause pain and other disturbances which might easily be mistaken for manifestations of gastric ulcer or gallstone disease or for acute indigestion. In other cases the hernial tumors are reducible and the usual impulse at the ring can be felt."

Returning to small umbilical hernias, the diagnosis is simple: Palpate for them in all obscure cases of pain in the abdomen or back. A slit-like defect can easily be felt. Upon finger-tip pressure, tenderness was present in all of the foregoing cases. An impulse is not very characteristic. The small hernia escapes when the muscles are relaxed or intraabdominal pressure increased. When the patient stands erect or when the recti muscles contract a pinch occurs at the opening. A very characteristic sign in all the preceding cases, except Case III, was a gurgling, liquid sensation to the finger when pressure was made over the distended sac, the contents slipping back through the narrow opening into the abdominal cavity. In Case III, where the back pain was the prominent symptom and the hernia was irreducible, the small sac was filled with adherent omentum. On inspection, when the sac is empty, the umbilicus may appear cup-shaped, when distended, full

or prominent. Eighty per cent of the epigastric hernias give gastric symptoms. What percentage of the umbilical type give symptoms referable to the stomach I am unable to state. Pain at the umbilicus may mean practically anything abdominal, so, unless hernias are thought of, the pain may not direct one to the condition, even though it be referred to the navel.

The treatment, of course, is operative and simple. These hernias are congenital. In childhood the opening tends to close, and will do so if assisted by strapping or pressure. Usually nothing is done; they give no noticeable symptoms, and later close. The peritoneal sac wholly or in part becomes obliterated, but the same little slit-like opening may remain. In later life a sudden muscular exertion forces out a small hernia through the imperfectly sealed sac and symptoms appear. Elaborate operative repair of the abdominal wall is unnecessary. There is no muscular relaxation or surrounding weakness of structures as in the large hernias. The pillars of the opening are extremely firm and dense. They will pinch the finger tip; they pinch the hernial protrusion and thus produce symptoms. Dissect out the umbilicus and close the peritoneal opening. Two strong sutures will close the defect in the aponeurosis.

Of course, there is nothing claimed for originality in this article. Neither is it intended to convey the idea that these small hernias belong to a different class from large umbilical hernias. It is simply to call attention to the fact that they do exist, and that they produce severe symptoms. From the anatomical arrangement at their location they are prevented, as a rule, from gradually enlarging, as do ventral hernias of the median line and elsewhere. Again, it is well worth while to carefully palpate the umbilicus and epigastrium for evidence of a small hernia in an obscure abdominal complaint.

REPORT OF A CASE RESEMBLING GANGOSA,¹ IN WHICH TREPONEMA PERTENUIS WAS PRESENT.

By Passed Asst. Surg. P. S. ROSSITER, United States Navy.

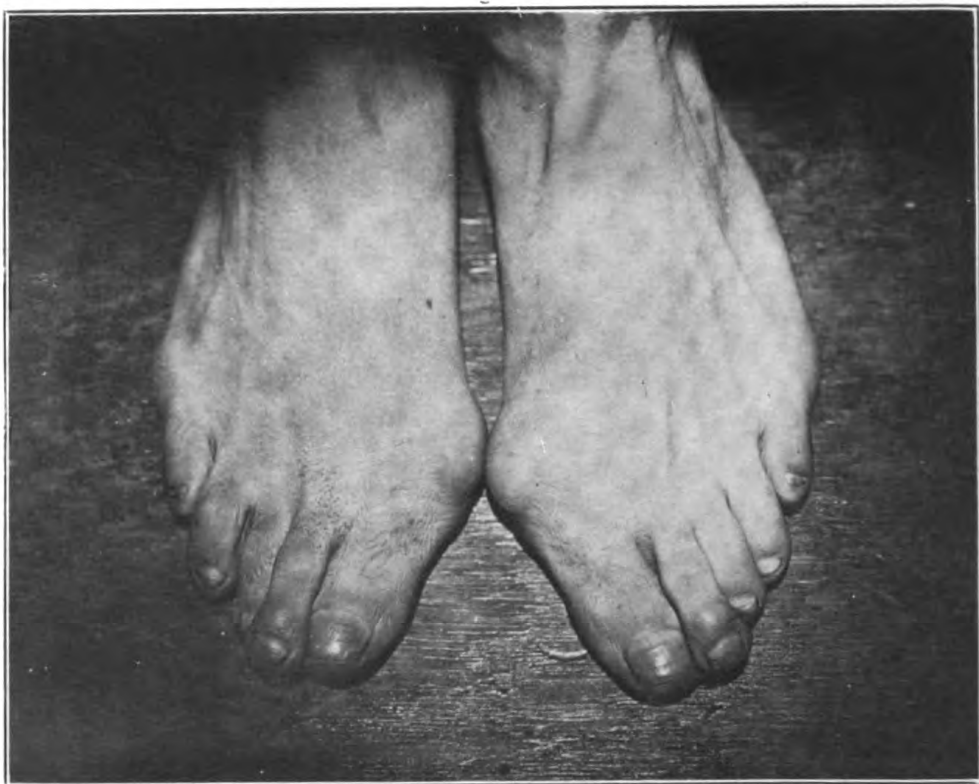
[From the United States Naval Station, Tutuila, Samoa.]

On August 20, 1909, a native child was brought to me with what appeared to be a marked case of gangosa.

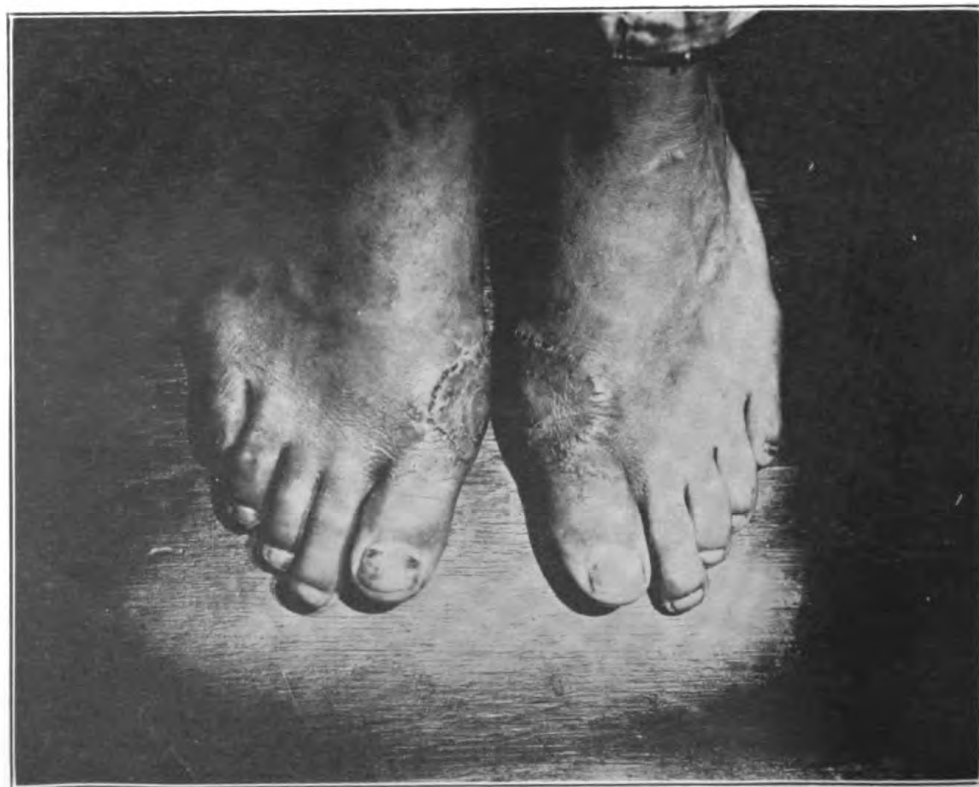
The cartilages and soft parts of the nose on the right side were partly destroyed; the ulceration had nearly obliterated the septum

¹ In the last issue of the Naval Medical Bulletin an article was printed over the signature of Passed Asst. Surg. P. S. ROSSITER, United States Navy, entitled "A Case Resembling Gangosa, in Which a Treponema Was Found." In editing this paper for the Bulletin its substance was so far modified as to have been misleading, in the opinion of the author, and it is, therefore, published in this issue as originally presented.

It is the desire of the Surgeon General to encourage medical officers to take an active interest in the Bulletin and submit articles of interest for publication, and to this end it is his intention that, when published, they shall be subject to no material change or modification.



Before operation.



After operation.

BUNION OPERATIONS.

nasi, and destroyed the anterior portion of the hard palate. It had also made extensive inroads on the right superior maxilla and encroached on the upper portion of the lip. The temperature was 99.2° F.

The following history was obtained :

T., female, Samoan, age 2 years. Had yaws two months ago; had no other sickness. Has had ulceration of the nose for five weeks, but had muco-purulent discharge from nostrils for about three weeks prior to the ulceration. One brother 4½ years of age is in good health. No member of family or neighbor has had a similar disease.

The ulcerated surface was carefully washed with a solution of sodium bicarbonate and a number of smears made; the following day more smears were made, and as the mother had to make a journey to another village, she was given a 30 per cent calomel ointment, with instructions to apply it daily to the ulcerated surface and to return in three days. During this time culture media was being prepared on which to work out any organisms present in the ulceration.

The case was not returned, and the child died one week later.

All of the smears were found to be swarming with *Treponema pertenuis*, and also to contain, along with other bacilli and cocci, large numbers of a rod-shaped bacillus which morphologically and in its staining characteristics resembled Geiger's bacillus of gangosa.

This is the only case I have seen here with active ulceration of the nasal septum and hard palate, but I have seen a number of cases of healed or partly healed ulceration of the soft palate and posterior portion of the hard palate which were alleged to have followed yaws.

Syphilis is unknown in this island; hence the questions naturally presented are:

Was this, and possibly the others, a case of gangosa or of yaws; or may gangosa be a lesion produced by the *Treponema pertenuis*?

A photograph of this case taken at the first visit is attached.

BUNION OPERATIONS.

By Surg. A. M. FAUNTLEROY, United States Navy.

A second-class fireman, aged 32 years, was admitted to the surgical service, U. S. S. *Solace*, April 25, 1911, with a diagnosis of bursitis (both great toes). On admission, the metatarso-phalangeal joint of both great toes, besides presenting the condition of marked hallux valgus, was considerably swollen, red, and apparently very painful. This condition had existed for a little over a year, and was attributed by the patient to poorly fitting shoes. For two weeks prior to admission he had been unable to wear a shoe of any kind; previous to that time he could only wear shoes for short intervals, and then he would be incapacitated for several days.

As the inflammatory condition of both joints was marked, he was kept in bed for five days. At the expiration of this time the swelling and redness had subsided and preparations were commenced for operation.

It was decided to perform the Mayo bunion operation on one foot at a time, as this would enable the patient to use the other foot in walking when the time came to exercise the joint operated upon.

The preliminary preparation consisted of shaving the foot and ankle and bathing twice daily for two days with ethyl alcohol for its drying effect on the skin. Half strength tincture iodine, in two applications, was painted over the entire foot and ankle in the usual way, and the operation commenced. This latter consists in turning down a crescentic skin flap on the inner aspect of the joint, followed by the careful dissection from behind forward of the tissue uncovered by the skin flap. This dissection is commenced about one-half inch behind the joint and is carried forward till the joint is opened. This fibrous tissue, dissected up, contains a bursa which forms on the bony prominence of the enlarged head of the metatarsal bone, and it is this bursa that is used in forming the new joint. It is to be noted that the base of this last flap is forward at the base of the first phalanx of the great toe.

When the joint has been thus opened up, a Gigli saw is slipped around the prominent head of the tarsal bone and the entire head removed, sawing from within outward in a gentle curve, making a convex end to the bone in preparation for the new joint. This latter is formed by tucking the free end of the flap containing the bursa into the space now formed between the two ends of the bones and anchoring this flap with a single cat gut stitch in the deepest part of the wound. There is thus placed between the bones the bursa, which is to be the synovial sac of the new joint.

Having secured the bursa flap in position and all hemorrhage controlled, the skin flap is now brought up and sutured in place, leaving a small opening at each angle for cat gut drainage. No splint is used.

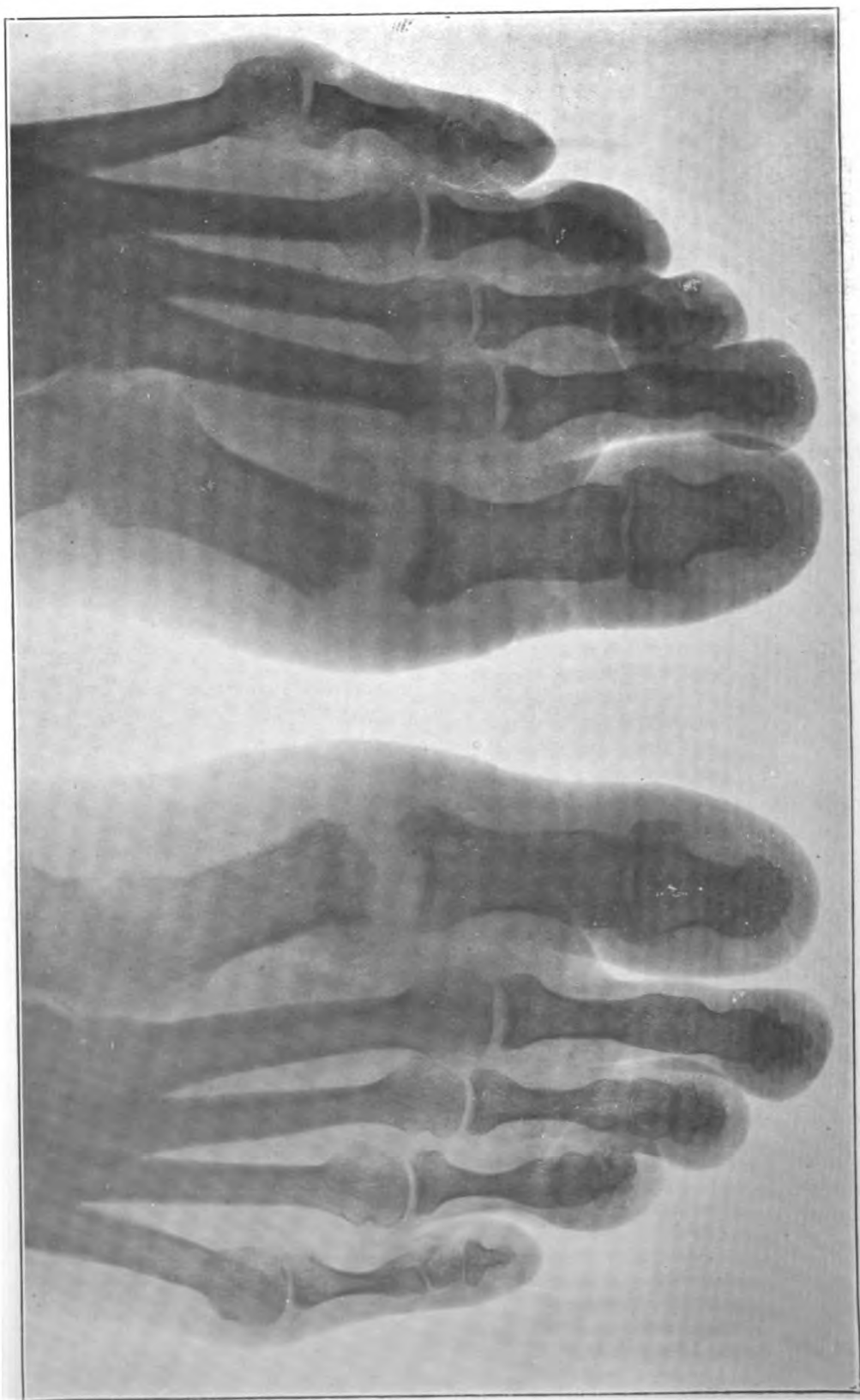
The first foot was operated upon May 2, 1911, and the second foot was operated upon May 15, 1911. During the interval between the two operations the first foot had entirely recovered its function, the patient being allowed out of bed on the tenth day to exercise the new joint.

The same procedure was followed in operating on the second foot. The cat gut strand was removed on the third day and all stitches on the eighth day, healing having taken place by first intention in each case.

Mayo recommended gauze pads wrung out in alcohol placed between the great and second toe for its antiseptic and drying effects.



BEFORE OPERATION.



AFTER OPERATION.

upon the skin, but this was not considered essential and only dry gauze was used.

A perfect result followed each operation, and the patient had apparently normal feet 10 days after the last operation.

I am indebted to Passed Asst. Surg. J. R. Phelps, United States Navy, for the photographs and radiographs showing the condition before and after operation.

LATE POSITIVE WASSERMANN IN SYPHILIS AND TUBERCULOSIS.

By Surg. W. B. GROVE, United States Navy.

The following case is noted in order to guard against too great reliance in a negative Wassermann reaction when symptoms are present that might be attributed to a syphilitic lesion.

F. L. K., chief yeoman, was transferred to this hospital September 25, 1911, as with tuberculosis of the lungs and "beginning grave mental impairment," for observation and final disposition. Examination confirmed diagnosis of tuberculosis of the lungs, and he was put outdoors in a tent, under a guard, for purpose of observation as to mental trouble. General physical condition good. Under clinical card entry of October 6 it is noted that repeated examinations failed to show any definite mental symptoms, and patient had gained in weight and felt better in every way.

October 7, about 8 a. m., patient had what seemed to be a very transient fainting attack, all effects of which passed within an hour. At this time a vague history of a sore on the penis about eight years previous was elicited. He stated that he remembers having taken for some months potassium iodide, but no mercury, and has had no treatment since, nor any symptoms referable to syphilitic infection, as far as he knows. All reflexes normal and a Wassermann was negative.

October 10, was surveyed and recommended that he be sent to the naval hospital, Las Animas, Colo.

October 16, about 4 a. m., had an epileptiform attack; was semi-conscious until about 7 a. m., when he became violent, and had to be forcibly held in bed; soon after become again semiconscious, and remained so for about 24 hours. Was fed by rectum.

October 18, was conscious and took food by mouth; at 7.30 p. m. became very violent, requiring restraint in bed; could not talk, but at times would yell and scream loudly. Morphine required to produce quiet.

October 20, condition growing worse, patient weaker, convulsions almost constant, pupils dilated, reflexes absent; 4 p. m., pulse became very weak, requiring stimulation; examination of eye grounds nega-

tive; right arm and legs slightly spastic, and twitching of right side of face very marked. Lumbar puncture attempted, but no fluid could be obtained.

October 23, condition shows slight improvement; is conscious, but can not talk; right-side seizures still frequent; all reflexes exaggerated. Has white count of 11,000; sphincter action lost; takes food by mouth. Wassermann strongly positive. Inunctions of mercury and potassium iodide in increasing doses.

From this time on all symptoms rapidly subsided, and at present (Nov. 13) patient is in about the same condition as when he entered this hospital.

Comment.—In view of the tuberculous condition of the patient, naturally the extension of the tuberculous process to the meninges was suspected. No temperature, slight vomiting, no actual paralysis, no increased tension in cord, with decided clearing-up of symptoms between the more violent paroxysms, as well as the negative condition of the eye grounds, made the diagnosis of tuberculous meningitis uncertain. A general paresis was also considered. The fact that as time elapsed the irritation could probably be localized in the left cortex, a brain tumor of some character was suspected. In spite of lack of all physical signs and symptoms of syphilis up to the time of seizure and the negative Wassermann, specific treatment was given, with the above-noted satisfactory results.

SALVARSAN IN FRAMBOESIA.¹

By Asst. Surg. GEORGE F. COTTLE, United States Navy.

Six cases of frambœsia have been treated at this station, and a preliminary report is made. It is hoped that a larger number of cases will be recorded, when more complete observation will be made.

THE PRIMARY SORE.

Case 1.—Samoan baby, 1 year, female. One month ago typical sore of this disease appeared on left leg. Spirochetes demonstrated; child feverish, thin, vomiting, poor appetite. Treatment: 0.05 gram Ehrlich's salvarsan, alkaline solution, given intramuscularly, gluteal region. Third day after injection gluteal region swollen and tender; temperature normal first time in two weeks. Ten days after injection child gaining weight; general condition much improved; lesion healed. One month after injection child apparently well; no recurrence.

SECONDARY LESIONS.

Case 2.—Samoan child, 18 months, male. Primary lesion appeared about two months ago; site of this lesion there is now typical, moist condylomatous-like sore about 1 inch by 2 inches. There are on neck, face, arms, and buttocks

¹ From United States Naval Station, Tutuila, Samoa.



FRAMBOESIA.



FRAMBOESIA.

about 12 lesions size of 10-cent piece and 8 or 10 smaller lesions on legs; general condition good; child fat. Treatment: 0.06 gram Ehrlich's salvarsan, alkaline solution, intramuscularly, gluteal region. Two days after injection gluteal region swollen and tender; lesions of the disease drying up. Eight days after injection all lesions healed, leaving smooth scars.

Case 3.—Samoan child, 3 years, female. Primary lesion appeared about two and one-half months ago and is now healed. There are scattered over body about 200 lesions, varying from size of pinhead to size of a quarter of a dollar. These lesions are most marked on forehead, neck, scalp, abdomen, buttocks, tibial and anal region; general condition good; child fat. Treatment: 0.25 gram Ehrlich's salvarsan, alkaline solution, intramuscularly, gluteal region. Two days after injection gluteal region swollen, tender; lesions drying up. Six days after injection many lesions healed. Ten days after injection no open lesions; all replaced by smooth scars.

Case 4.—Samoan child, 1 year, 2 months, male. For about two months this child has been treated with KI, gram 1, a day and has had about 20 or 30 small open lesions. Improvement under KI did not continue; large number of fresh lesions appeared until, when given salvarsan, there were over a thousand lesions upon its body. Most of these lesions were smaller than split pea. There were 4 or five larger lesions, size quarter dollar. (See illustration.) Treatment: 0.2 gram Ehrlich's salvarsan, alkaline solution, intramuscularly, gluteal region. Two days after injection lesions drying up. Six days after injection all lesions healed, replaced by smooth scars.

LATE LESIONS—LARGE ULCERS.

Case 5.—Samoan, 38 years, male. Four large, dirty ulcers on leg, largest about 3 by 4 inches; smallest about 2 by 2 inches. Treatment: 0.25 gram Ehrlich's salvarsan, alkaline solution, intravenously combined with curettag and disinfection of ulcers. No ill effects followed administration of drug. Seven days after injection, clean, red. One month after injection, largest ulcer still uncovered by epidermis, less than one-half original size; other ulcers healed. In this case there has been no return of the pale, sluggish granulations generally seen in these ulcers after simple curettag.

LATE LESIONS—LARGE ULCERS.

Case 6.—Samoan, 30 years, male. Forearm shows 2 ulcers size palm of hand; 1 size silver dollar; sluggish, dirty granulations. Has been treated for weeks with KI without real improvement. Treatment: 0.4 gram Ehrlich's salvarsan, alkaline solution, intravenously combined with curettag. Four hours after injection, temperature 102; feels chilly; no other ill effects. One week after injection, no return of sluggish granulations which commonly recur after simple curettag. Ulcer is now clean, red, healing.

Of these six cases, the first four are undoubtedly yaws, though in only the first was the treponema demonstrated. Undoubtedly, the use of salvarsan in these cases brought about the disappearance of the lesions in a time which can be counted in hours, whereas the only drug here found of any curative use—that is, KI—has never resulted in a cure in a less period than many weeks.

The therapeutic result here recorded gives a most definite and brilliant apparent cure in this most prevalent of diseases in this part of the world, and it apparently heralds the day when this disease can be eradicated.

The last two cases cited are typical of a form of ulcer which is said to be the late manifestation of this disease.

In these cases the drug salvarsan has apparently been a marked factor in their early healing.

SALVARSAN IN FILARIASIS.¹

By Asst. Surg. GEORGE F. COTTLE, United States Navy.

American Samoa is one of the tropical countries where filariasis in man is extremely prevalent. The exact incidence in the native population is not known. For a native to have a shaking chill with headache and backache sufficient to cause him to lie on his mats with fever for three, four, or seven days every few weeks or months during his life is so common as to be almost looked upon by the natives as a normal condition.

So well understood is this filarial fever that seldom will a native seek medical care for it.

Abscesses, lymphangitis, and scrotal swellings are also of so frequent occurrence that the Samoans have worked out definite methods of treatment for them all.

The native guard, "fita fitas," a body of men enlisted from the Samoan people, contain 75 men. A study of filariasis in them would give an index of the disease in the population. A microfilaria demonstrable both day and night has been found in the blood stream of 54 per cent of these men. A study of their sick records, during the 15 months preceding July 1 of this year, shows 685 sick days from conditions probably filarial in origin. The percentage of sick from this cause being 1.44, while the total percentage of sick for the same period among the "fita fitas" was about 3.

Elephantiasis, a condition long considered of filarial origin, is not present in the guard. Its prevalence in the native population, however, will strike the most casual observer, though Manson's statement that it is present in every second individual is beyond the truth at this time.

Many different curative measures have been advocated. At this station many have been tried out for the disease. None apparently have met with real success. An attempt has been made to teach the people the need for mosquito eradication, and the need of mosquito bars has been to a great extent successfully taught. It is possible that these measures have lessened the degree of infection.

The drug most used here is the tincture of ferric chloride, gram 2, three times a day for long periods, several weeks.

¹ United States Naval Station, Tutulla, Samoa.

Some observers here have noted a reduction in the number of microfilaria seen in the blood following the use of this drug and a lessened number of attacks of fever. This observation has not been borne out by my experience. There are, however, many Samoans who feel sufficiently benefited by this drug to persist in taking it for the long period said to be necessary.

Treatment of the lymphangitis (called here "mumu"), and of the abscesses, is surgical, and of great service in shortening an attack or lessening the ill effects of abscesses.

Nine "fita fitas" and one hospital apprentice, all Samoans, volunteered to take and have now been given 0.3 gram each of Ehrlich's salvarsan in order to learn if it had any curative value in this infection.

A tabulated report of these cases follows: Ten Samoan men, ranging in age from 23 to 41 years, were given 0.3 gram of Ehrlich's salvarsan; the first eight were given the drug in alkaline solution intravenously; the one called No. 9 was given the drug in alkaline solution subcutaneously; the one called No. 10 received the alkaline solution intramuscularly.

Tabulated history.

No.	Fevers.		Lymphangitis.		Abscesses.	Bladder and scrotum.
	Recorded.	Own statement.	Recorded.	Own statement.		
1	Six in 4 years.	Many attacks.....	None.....	Many times.....	Several....	
2	Two in 5 years.	Several a year.....	Two in 5 years.	Often.....	Three in 3 years.	
3	Two in 3 years.	Frequently.....	None.....	None.....	None.....	Hydrocele (operation).
4	None.....	None.....	do.....	Once.....	Four.....	
5	Two in 1 year.	Once.....	One.....	None.....	None.....	Orchitis; chylous hydrocele (operation).
6	One.....	Twice a year.....	Two.....	Twice a year.....	Two.....	
7	Two.....	Once a year.....	None.....	None.....	None.....	
8	do.....	Twice a year.....	Three.....	Twice a year.....	Five.....	
9	do.....	Occasionally.....	Four.....	Occasionally.....	Three.....	Cystitis; hydrocele.
10	Six in 6 years.	Three a year.....	Two.....	Often.....	do.....	Orchitis.

During the past five years the three successive medical officers of this station have recorded the presence of a microfilaria in all but three of these men.

During the past few months repeated examinations have been made and microfilaria have been easily found each time.

It has been thought best in studying the effect of the drug salvarsan to observe the number and the motility of the microfilaria before and after the administration. It will be necessary to leave the observation of any possible effect on the number of fevers or the number of complications of the disease until a much later day.

Blood examinations showing approximate numbers before and after use.

No.	One-half hour before.	One-half hour after.	1 day later.	2 days later.	5 days later.
1	1½ to field.	Present.	1 to field.	2 to field.	5 to field.
2	1 to field.	do.	½ to field.	do.	3 to field.
3	2 to field.	do.	do.	½ to field.	½ to field.
4	1 to field.	do.	1 to field.	2 to field.	2 to field.
5	do.	do.	½ to field.	3 to field.	½ to field.
6	5 to field.	do.	3 to field.	6 to field.	4 to field.
7	½ to field.	do.	Absent.	½ to field.	½ to field.
8	2½ to field.	do.	2 to field.	4 to field.	5 to field.
9	1 to field.	do.	½ to field.	½ to field.	½ to field.
10	2½ to field.	Absent.	Absent.	Absent.	Absent.

¹ 2 weeks before.

No ill effects followed the use of the drug, except that four of the cases had a chill, with rise of temperature to about 99.2° F.

Case No. 10 is of sufficient interest to be detailed more fully, because by itself it might easily be taken for a cure.

Case No. 10.—A., hospital apprentice, Samoan. During the four years of his first enlistment he had several attacks of lymphangitis ("mumu"), about six abscesses, and at least four attacks of filarial fever. Three of these attacks took place during the last year of the first enlistment, so that their frequency was apparently on the increase.

During the six months following his reenlistment he has had two severe attacks of fever, followed by a swelling of the testicle, such as is not infrequently noticed in the course of this disease.

His fevers are always severe. He awakes with a feeling of chilliness or slight headache. After a shaking chill he has severe headache and backache, with a temperature of 104. This temperature will gradually come down day by day and his symptoms lessen, until by the fifth day after onset he is nearly well; temperature, 99°; poor appetite and slight weakness. By the tenth day, or perhaps sooner, he is back attending to his duties and practically well.

His blood has been repeatedly examined during the past year, and at every examination microfilaria have been found; average of two to each field.

They would become slightly fewer in the febrile periods, but were never absent entirely.

The evening after receiving 0.3 gram of salvarsan intramuscularly there were no microfilaria found in his blood, nor have any been demonstrated since.

Unfortunately, previous to the administration no examination of the blood had been made for about two weeks. It had been considered unnecessary, since repeated examinations made during the year past had always shown the blood positive.

This case was the first to receive the drug, and the apparent success was distinctly encouraging. Two weeks after the drug the pa-

tient stated he had not felt so well in years, and up to the present—one month after the drug—he has had no fever.

It is believed that in this case the disappearance was due to a natural remission in the disease, perhaps associated with the attack of testicular enlargement rather than a disappearance due to the drug.

This conclusion is forced upon us by the fact that no such effect has been observed in the nine other cases which received the same dose of the drug. It will be important to continue the observations of these cases for a much longer period than noted here, for it is not at all impossible to conceive that the drug may have an effect on the parent worms, even if it has none on the microfilaria in the blood stream. If such an effect should occur a long period of observation and study may be necessary to prove it.

CURRENT COMMENT.

ASSOCIATION OF MILITARY SURGEONS.

The twentieth annual meeting of the Association of Military Surgeons of the United States was held in Milwaukee, Wis., September 26 to 29, 1911.

The following officers were elected: President, Surg. C. P. Wertenbaker, United States Public Health and Marine-Hospital Service; first vice president, Surg. W. C. Braisted, United States Navy; second vice president, Brig. Gen. Charles Adams, National Guard, Illinois; third vice president, Lieut. Col. J. R. Kean, United States Army; secretary, Maj. Charles Lynch, United States Army; treasurer, Maj. Herbert A. Arnold, National Guard, Pennsylvania; assistant secretary, Surg. T. W. Richards, United States Navy.

The advisory board is composed of the following members: Hon. Franklin MacVeagh, Secretary of the Treasury; Hon. Henry L. Stimson, Secretary of War; Hon. George v. L. Meyer, Secretary of the Navy; Surg. Gen. George H. Torney, United States Army; Surg. Gen. Charles F. Stokes, United States Navy.

The executive council is composed of the officers of the association ex officio and Maj. Paul F. Straub, United States Army, General Staff, Washington, D. C.; Medical Director W. R. DuBose, United States Navy; Asst. Surg. Gen. J. W. Kerr, Public Health and Marine-Hospital Service; Lieut. Col. J. A. Hall, National Guard, Ohio; Lieut. Col. William G. Schaufler, National Guard, New Jersey; and Maj. Thomas C. Clark, National Guard, Minnesota.

The literary committee is composed of the following members: Asst. Surg. Gen. J. W. Trask, Public Health and Marine-Hospital Service; Lieut. Col. M. W. Ireland, United States Army; Passed Asst. Surg. Ralph W. McDowell, United States Navy; Maj. W. S. Conkling, National Guard, Iowa; Maj. Charles W. Decker, National Guard, California; First Lieut. A. H. Lindorme, National Guard, Georgia; Lieut. M. W. Houghton, Naval Militia, Rhode Island.

The publication committee is composed of the following members: Maj. Charles Lynch, United States Army; Surg. Robert M. Kennedy, United States Navy; Asst. Surg. Gen. J. W. Trask, Public Health and Marine-Hospital Service; and Maj. Romulus A. Foster, National Guard, District of Columbia.

The necrology committee is composed of Maj. Samuel Cecil Stanton, National Guard, Illinois; Capt. A. G. Love, United States Army;

Surg. Arthur W. Dunbar, United States Navy; and Acting Asst. Surg. W. H. Marsh, Public Health and Marine-Hospital Service.

The following gentlemen compose the committee on legislation: Lieut. Col. Henry Allers, National Guard, New Jersey; Col. James B. O'Neill, National Guard, Maine; Brig. Gen. E. C. Brush, National Guard, Ohio; Lieut. Col. Wilbur S. Watson, National Guard, Connecticut; Brig. Gen. Charles C. Foster, National Guard, Massachusetts; Col. Henry Bacon, National Guard, Florida; Brig. Gen. F. J. Lutz, National Guard, Missouri; Lieut. Col. David S. Fairchild, National Guard, Iowa; Maj. D. S. Burr, National Guard, New York; Maj. Homer I. Jones, National Guard, Indiana; Lieut. Col. A. S. Strayer, National Guard, Pennsylvania; and Maj. Gilbert E. Seaman, National Guard, Wisconsin.

The next annual meeting of the association will be held at Baltimore, Md.

RED CROSS.

The Ninth International Red Cross Conference will be held in Washington, D. C., May 7 to 17, 1912. In connection with this conference, a special temporary building will be erected, which will contain two exhibitions—one as a general exhibit, in which all Red Cross associations have been invited to participate, and the other for the special purpose of displaying articles submitted for the Marie Feodorovna prize competition.

Subjects for competition are as follows:

“1. Organization of the methods of evacuation of the wounded on the battlefield, comprising as complete an economy as possible in litter bearers.

2. Portable (surgeons') washstands for war.

3. Methods of dressings at the aid stations and in the ambulances.

4. Wheeled stretchers.

5. Carriage of stretcher on mule back.

6. Folding stretcher easily portable.

7. Transport of the wounded between war vessels, hospital ships, and the coast.

8. The best method of heating railroad cars by a system independent of steam from the locomotive.

9. The best model of a portable Roentgen apparatus, permitting utilization of X rays on the battlefield and at first-aid stations.”

As several of these subjects are of particular importance to medical officers of the Navy, it is to be hoped that general interest will be aroused throughout the Medical Corps and that a number of devices and papers will be submitted.

Further information may be obtained from the chairman, exhibition committee, American Red Cross, Washington, D. C.

TYPHOID FEVER.

In the annual report of the Surgeon General of the Navy recommendation is made that all persons in the naval service under the age of 45 years be inoculated against typhoid fever. During the year 1910 there were 193 cases of typhoid fever in the Navy and 10 deaths.

An outbreak of typhoid fever in the Pacific Fleet recently resulted in several cases. The following fleet general order was published:

Fleet General Order No. 7.

UNITED STATES PACIFIC FLEET,

U. S. S. "CALIFORNIA," FLAGSHIP,

Off San Diego, Cal., October 26, 1911.

1. The causes that led to a recent outbreak of typhoid fever on board one of the vessels of the fleet have been investigated by a board of medical officers. The report of this board justifies the conclusion that there is more than a reasonable ground for attributing the infection to an occasional, although infrequent, overflowing of the troughs in the crews' head, the filth therefrom being in consequence tracked around the ship, with a probability of isolated cases of food contamination resulting through the prevalence of flies.

2. The following recommendations of the board above mentioned are quoted for the information of the fleet, and to serve as a guide as to the measures that may appropriately be taken to safeguard against similar infection in other vessels, viz:

(a) All parts of men's heads shall be hosed daily with live steam, washed, and disinfected.

(b) The outboard delivery pipes shall be flushed twice a day with hose.

(c) A man shall be on watch at all times in the heads to prevent an overflow.

(d) The crew shall be impressed with the importance of the extermination of flies and a constant warfare be kept up against this pest.

(e) In order to prevent the accumulation of dirt in the crew's water-closets, all unnecessary piping should be removed from the inside of the troughs. When it is absolutely necessary for such pipes to be inside they should be placed far enough away from the side to enable one to clean beneath them.

(f) To prevent the possibility of a similar outbreak occurring on other ships, the above precautions should apply to all ships in the fleet.

3. The commander in chief is constrained to emphasize to all under his command the importance constantly of exercising the greatest vigilance in maintaining the highest possible state of sanitary efficiency; and in particular, of taking effective measures: For the extermination of flies; for preventing any possible contamination through improper regulation of the pressure in the flushing system or through overflow in any water-closets due to any other cause; for so contriving the direction of the flow of water in the refuse or swill chutes as to thoroughly cleanse the sides thereof; and for reducing to a minimum the likelihood of spreading tuberculosis through spitting on the decks, into scupper holes, or in any place other than receptacles especially provided therefor and which contain a suitable germicide.

CHAUNCEY THOMAS,

Rear Admiral United States Navy,

Commander in Chief United States Pacific Fleet.

YELLOW FEVER AT HONOLULU.

A case of yellow fever in the convalescent stage arrived at Honolulu, October 21, on the steamship *Hongkong Maru*, from Manzanillo, Mexico. On October 28 a quarantine employee detailed as guard on the *Hongkong Maru* sickened with yellow fever. Prompt, energetic measures to prevent the spread of this disease have been instituted.

Yellow fever has also been reported in Merida, Mexico. The total number of cases from August 1 to October 28 was 41, with 16 deaths.

NEW NAVAL HOSPITAL FORMALLY OPENED.

The United States naval training station, Great Lakes Naval Station, Ill., was formally opened on October 28, 1911, and the medical department is now in full commission. The hospital and two dispensaries are of the latest design and fully equipped for the treatment of disease and injury.

PROGRESS IN MEDICAL SCIENCES.

GENERAL MEDICINE.

Surg. A. W. DUNBAR and Passed Asst. Surg. J. D. NEILSON, United States Navy.

BONNEY, SHERMAN G., A. M., M. D. **Experiences with pulmonary tuberculosis during the last year.** American Journal of Medical Sciences, November, 1911.

A world-wide crusade against tuberculosis has been in progress during the last few years. The sociological and economical features have received extensive study, and not the least important phase has been the educational propaganda instituted.

Effective results have been obtained, as is seen by the lessened mortality rate in some of the larger cities, by wise municipal regulations producing improved hygienic conditions in the home and in the shop.

It is doubtful if in the management of the actual disease there has been a corresponding advance.

The writer has had an excellent opportunity to observe certain tendencies in the treatment of the disease by the profession at large and by comparison arrives at the following conclusions:

There is, in the last two years, a tendency to sending patients in an early stage of the disease to Colorado, the average delay after the recognition of a tuberculous condition being reduced from 16½ months to 6 months. Indeed, so far has the pendulum swung that 25 per cent of a series of cases sent to seek climatic aid had no physical signs whatever of tuberculosis.

Two errors are apparent, one an overnicety in physical diagnosis, the other too great a reliance upon home or institutional treatment, with the result that climatic assistance is invoked too late. An increasing, but nonbeneficial, use of tuberculin and of mercury is noted.

The value of rest, and also the obverse, moderate exercise in suitable cases, is not appreciated.

The beneficial effect of the climate of Colorado is evident in many cases, as shown by the almost general gain in weight in that environment, but a continued absence of physical signs over a period of two years is requisite to pronounce a cure, and a continued residence in that climate is desirable to preclude a relapse, which frequently occurs if the patient returns to his former occupation.—(A. W. D.)

MOFFITT, H. C., M. D. **Is pernicious anemia of infectious origin?** *American Journal of Medical Sciences*, October, 1911.

The group of cases still remaining under the title of cryptogenous pernicious anemia wherever found are symptomatically much alike, the constancy of these symptoms pointing to a clinical entity the result of some specific intoxication. It is generally recognized that the marrow changes in pernicious anemia are regenerative in nature and not specific. Efforts to isolate a lipoid substance as the cause of the pathological hemolysis are inconclusive.

The theory of intestinal putrefaction as a cause appears untenable, this condition being secondary rather than primary.

The writer notes seven cases from one valley of California, and Swiss authors have observed evidences of the occurrence of the disease in apparent endemics.

Von Jacksch and Klemperer have suggested a protozoal origin which is supported by many points of similarity between pernicious anemia and trypanosomiasis, as: Anemia, fever, remissions in the clinical symptoms, nervous symptoms, and the presence of lipoid substances causing hemolysis.

Arsenic, the only remedy of value in pernicious anemia, is a specific in syphilis and in some forms of trypanosomiasis.

Equine pernicious anemia has been transmitted by intravenous inoculation and also by feeding the blood and urine of infected animals to others. Epidemics of this disease have been noted in Nevada.

During the past year the writer has attempted unsuccessfully to demonstrate protozoa in the blood of human beings suffering from pernicious anemia both by staining and by cultural methods. Guinea pigs have been inoculated, with negative results. It is now purposed to try inoculation of large amounts of blood from the spleen, and also tissue extracts, into dogs, monkeys, and horses.—
(A. W. D.)

FRENCH, HERBERT, M. A., M. D., F. R. C. P. **Differential diagnosis in cases of albuminuria.** *British Medical Journal*, February 15, 1911.

The author introduces the subject with a description of the well-recognized acetic acid and boiling and cold nitric acid tests for albumin, emphasizing the methods for distinguishing those substances which give rise to confusion in these tests. He then groups all cases of albuminuria under three heads: (a) Albuminuria with renal tube casts without obvious pus; (b) Albuminuria with renal tube casts with obvious pus; (c) Albuminuria without renal tube casts.

The first group he discusses in detail under the headings: (1) Various forms of Bright's disease; (2) Nephritis of pregnancy; (3) Chronic ascending nephritis; (4) Lardaceous disease of the kidney; (5) Infarction of the kidney; (6) Thrombosis; (7) New growths of the kidneys.

The second group he touches upon very lightly, as he is to write a special article on the subject later.

In the discussion of the third group he goes into detail and makes special reference to the interesting condition known variously as "physiological," "accidental," "essential," "postural," "cyclic," "orthostatic," "intermittent," "functional," or "orthotic" albuminuria occurring in males from 15 to 30 years of age. This condition is not well understood, as is shown by the number of men who are still rejected in life-insurance examinations and examinations for various services simply on the presence of albumin in the urine.

Collier and others, in their examination of the urines of "crews," found that urine voided just before a boat race and found free of albumin might be loaded with it directly afterwards, and again free of it after a lapse of a few hours.

A prominent feature in these cases is that the morning specimen is quite normal, while one passed later in the day may contain "anything from a trace to 5 parts per 1,000 of albumin. The more such a man exerts himself, or the more he has exposed himself to cold, the more liable he is to this 'unimportant,' but possibly alarming, albuminuria."

Some cases may pass albumin for days before an interval of freedom occurs. They may appear to be in robust health, sometimes they are a little pale, and they may or may not be nervous. "A natural nocturnal emission is supposed to predispose to albuminuria next day." To distinguish these cases the author gives the following directions: "A complete routine examination is carried out, and no obvious affection of the heart or other viscera can be detected; the blood pressure is normal; the albumin having been discovered, the patient is directed to supply a series of samples at intervals of a few days, and preferably passed immediately after rising in the morning. If all the samples contain albumin, it will be difficult to exclude organic disease; if some contain albumin in abundance, however, and others none at all, the presumption will be that it is 'functional'; before being finally satisfied, however, it is important that a careful microscopical examination of the centrifugalized deposit from a specimen containing albumin should be made, no casts or other abnormal constituents being found. The administration of calcium chloride greatly diminishes the tendency to this form of albuminuria. In an adolescent male, who has no symptoms, albuminuria discovered accidentally, present after exertion or after exposure to cold, but

absent after rest in bed, and, when present, not associated with renal tube casts or with signs of arterial, cardiac, or other diseases that should be detected by physical examination, is almost certainly a 'physiological' albuminuria, which needs no treatment and is not indicative of any underlying disease."—(J. L. N.)

CHAMBERS GRAHAM, B. A., M. B. Observations on the urine of marathon runners. British Medical Journal, March 4, 1911.

Chambers made an examination of the urine of eight athletes before and after the race. It is noted that one specimen contained an excess of indican before and was obliged to give up the race at the seventh mile because of abdominal cramps and vomiting, which would indicate the importance of keeping the digestion of an athlete in good condition.

He summarizes the results of the examinations as below:

BEFORE THE RACE.

1. "Nucleo-albumen," albumen, globulin, and sugar absent in every specimen.
2. Indican present in much excess in one urine. In the other specimens it was present in normal quantities.
3. The sediments, which appeared normal to the naked eye, showed nothing abnormal microscopically except oxalate crystals, which were present in five of the eight specimens.

AFTER THE RACE.

1. Seven specimens contained "nucleo-albumen," albumen, and globulin, and in the sediments hyalin and faintly granular casts and epithelial cells. In three of these there were in the sediments red-blood corpuscles; in five calcium-oxalate crystals sparsely distributed.
2. One specimen was free from "nucleo-albumen," albumen, and globulin, but contained hyalin and faintly granular casts in the sediment.
3. Sugar absent in all.
4. The tests for indican gave practically the same results as those before the contest.—(A. W. D.)

GOTTHEIL, WILLIAM S., M. D. Alcohol in dermal therapeutics. Progressive Medicine, September, 1911.

The author discusses the use of alcohol in dermal therapeutics as a vehicle for other drugs and as a direct therapeutic agent. It is valuable as a menstrum for application of the tars, mercurials, etc., when the oily or fatty vehicles are inapplicable. Older dermatologists employed it as a direct application for phlegmonous and other inflammations. It has been little employed until recently, and the testimony as to its wide range of usefulness is increasing.

It is directly applied as a deodorant, and benefits certain inflammatory processes of the skin and subcutaneous tissue. Kaiser treats many cases of inflammatory skin affections with alcohol dressings, and says that nothing better could be desired; Lauder Brunton uses absolute alcohol to check the itching of pruritis ani, and Dupas and others advise a 90 per cent alcohol application for the treatment of herpes zoster.

Calling attention to the favorable results obtained by the proper use of alcohol in the treatment of eczema, the author reviews the results obtained by others. Bockhart uses it in that large class of eczematous and dermatic inflammations of the skin in which the ordinary remedies in watery solution can not be employed. He uses it to destroy the bacteria and their toxins on the affected skin, to prevent complicating impetigo, pyodermatitis, and furunculosis; and finally to prevent further attacks. The results are excellent.

With the exception of the most acute cases with excessive secretion, fissuring, etc., the eczema cases are treated by gently cleansing the affected area and surrounding tissue with cotton saturated with 90 per cent alcohol. This is done twice daily and between cleansings appropriate treatment with powders is carried on. The itching is relieved and the improvement is marked.

The germicidal effect of the alcohol is shown here just as it is in the use of iodine tincture in skin disinfection; caution must be used with iodine tincture, for the repeated irritant action of the iodine and alcohol might readily increase dermal inflammation.—(PASSED ASST. SURG. R. W. McDOWELL.)

Baldness and baldness cures. *Progressive Medicine*, September, 1911.

Gottheil, in the section on "Dermatology," *Progressive Medicine*, deprecates the tendency to treat this matter as a joke, mentions its disadvantages, and gives Schamberg's scheme of the etiology of baldness. He confines himself to the common forms of premature or senile alopecia, which are commonly associated with or follow prevalent scalp affections known as seborrhea or eczema seborrheicum.

The growing prevalence of the habit of pursuing open-air business and recreation without any head covering is important in its relation to baldness. The skin and its appendages are peculiarly susceptible to the sun's rays.

Overindulgence in sun baths is prejudicial to the human organism, causing irritability and nervousness, cardiac and circulatory disturbances, and more or less serious dermal lesions. Eminent dermatologists proclaim their belief, based on long series of cases, that pro-

longed exposure to the rays of the sun finally causes marked baldness. The effect of the X rays is similar to that of the actinic rays of the sun in causing this condition.

However, we should not jump from one extreme to the other and frown upon the hatless habit. It has its advantages, and there is evidence that savages in tropical climes, who wear little or no head protection, are rarely bald. Moreover, it is a question whether interference with the circulation, which is undoubtedly caused by our modern tight-fitting hatbands, is not at least as injurious to hair growth as prolonged exposure to the actinic rays of the sun.

Almost every dermatologist has his own favorite method of treatment of baldness, but the following plan of treatment is recommended:

The scalp is shampooed frequently with a good tar soap, and then the following solution is well rubbed in: Resorcin albisumum, 1 to 4 drams; glycerin, one-half dram; tincture of capsicum and tincture of cantharides, of each 1 dram to 1 ounce; cologne water enough to make 8 fluid ounces. Beginning with the weaker strength, the amount of the active ingredients is gradually increased as the scalp requires it.

The whole matter of the treatment of baldness, apart from special measures required by the presence of any definite disease, resolves itself into the stimulation of the tissue of the scalp and increasing the blood supply of the hair follicles. This should be done intelligently and persistently by a second person, who can see what he is doing and who should use a brush and not the fingers when shampooing and applying the lotion. He should brush vigorously and use little sympathy. It should be done persistently for months. Some persist in the treatment and get results; others do not and *get bald*.—(PASSED ASST. SURG. R. W. McDOWELL.)

Gouget. Relationship of syphilis and tuberculosis. Jour. des praticiens, November 26, 1910.

The writer states that syphilis, particularly in its secondary stage, predisposes to tubercular infection, and quotes Sergent as believing that the connection is intimate. Statistics show that alcoholism exceeds it as a cause. The prognosis in the combined infection is bad, the progress of the disease being rapid. Gouget believes that mercury, on the whole, is not contraindicated, but discontinues its administration by mouth, using instead the benzoate or biniodide hyperdermatically.—(A. W. D.)

MELTZER, S. J., M. D., LL. D. The present status of therapeutics and the significance of salvarsan. Jour. of the A. M. A., June 10, 1911.

In this paper Meltzer meets some of the objections published by certain syphilographers, directed against treatment of syphilis by salvarsan, with characteristic scientific straightforwardness, tracing such objections to either unjustifiable bias or to equally inexcusable ignorance of the facts. Salvarsan continues to stand, not alone as the first real scientifically constructed therapeutic triumph in medicine, it also remains the exquisitely specific remedy against all syphilitic manifestations. The untoward effects on certain important nervous and blood-vascular tissues, occasionally noted to follow the administration of salvarsan, in chronic cases of syphilis, are due to its action on portions partly invaded and destroyed by the syphilitic virus. The processes of repair, initiated by the destruction of such syphilitic foci through salvarsan, take on the acute form, manifesting themselves in acute neuritis, etc., according to their location. Meltzer, however, admits that the much hoped for "*Sterilitatio magna*" obtained in experimental animals has not been obtained in human beings, and several injections are necessary to produce this effect. The danger of repeated injections appeared to be that they would give rise to resistant strains of spirochaetes. Since, however, it has recently been shown by Margulies, in Erlich's Institute, that, contrary to what occurs on the administration of arsacetin and arsenophenylglycin, salvarsan does not produce strains of spirilla resistant to it, a fact, moreover, confirmed by clinical experience. Meltzer advocates, instead of one large dose, the use of injections of small doses, to be given for some time at regular intervals, and injected into the lumbar muscles. This method would become a safe one even in the hands of the general practitioner.—(MEDICAL DIRECTOR H. G. BEYER.)

AUER, J., Dr. The effect of salvarsan upon the heart in dogs. J1. Exp. Med. Vol. XIV, No. 3, 1911, p. 248.

During an investigation on the tolerance of salvarsan by rabbits, it had been noticed that the blood pressure sank abruptly and profoundly during intravenous injection of the drug, and thus the impression was produced that this was caused by a sudden weakening of the heart. Auer used dogs, anaesthetized through intra-tracheal insufflation, under curara, with a canula introduced into the external jugular vein and the exposed heart inclosed in an oncometer; in addition the carotid pressure was recorded by a Hürthly manometer. He

used alkaline and acid solutions of salvarsan. He sums up the results of his work in the following statements:

The intravenous infusion of 0.5 per cent acid "606" causes a weakening of the heart which is usually fatal.

The intravenous infusion of 0.5 per cent alkaline "606" causes no marked apparent effect upon the heart, but its factors of safety may be so reduced in some instances that a slight extra strain produces fibrillation and death.—
(MEDICAL DIRECTOR H. G. BEYER.)

GENNERICH, Dr., Marine-Stabsarzt. The serum reaction of Wassermann, its utilization in the Navy, in view of the intermittent treatment of syphilis by mercury. "Veröffentlichungen aus d. Gebiete des Marine-Sanitäts-wesens, Medizinal-Abteilung des Reichs-Marine-Amtes," Heft 3, Berlin, 1911, Mittler u. Sohn, pp. 56.

The observations made in the "Marine-Lazarett, Kiel-Wik" during the last three years have resulted not alone in a better appreciation of the clinical significance of the reaction of Wassermann, but they have likewise thrown additional light on the value of the different methods of treatment of syphilis. While, as is well known, its diagnostic value is generally well recognized, its indications with regard to prognosis and treatment are greatly in need of further research.

After the specific character of the reaction had to be given up, the different experimenters were divided into two camps, one inclining toward a chemico-physical basis for the reaction, the other adhering to the biological nature of it. According to some authors, the syphilitic antigens pass from the infected part into the blood and thence into various organs, where they initiate changes of a degenerative nature in the cells. The cleavage products of the altered cells leave the degenerated cells, pass into the blood, and there produce antibodies (antibodies against their own body cells). Such a process would harmonize well with the fact that hæmolysins have been detected in the blood of patients suffering with paroxysmal hæmoglobi-nuria. According to others, it is lipoids that possess the property of producing antibodies, and Bruck believes that the active substance in luetic serum is a combination between lipoids and albumin. On account of the stronger effect of luetic extracts as compared to extracts obtained from normal organs, Bruck believes that, in the complement deviation by luetic extract and luetic serum, two factors are called into play, (1) the nonspecific factor of the auto-antibody-effect upon albumino-lipoids, and (2) the specific factor of the syphilis antibody effect upon syphilitic antigen.

With regard to the specificity of the reaction, Bruck obtained 53 positive results from 5,028 normal sera. In the hospital at Kiel-Wik no abnormally reacting sera could be observed at all. In the meantime it has been found that syphilis is much more widespread than

had been supposed, and that a large percentage of cases is nonsexual in origin. Every syphilitic is a germ carrier and should be isolated, the same as bacillus carriers of other diseases, until cured.

The serum reaction as a means of early diagnosing syphilitic infection is unreliable, and even a negative reaction beyond the seventh week after infection is not to be depended upon. Fresh secondary cases give positive reactions in 98 per cent of the cases occurring at Kiel-Wik. Gennerich observed two cases of syphilitic exanths giving negative reactions. Soon after the first injection of calomel the serum reaction became positive.

The significance of the Wassermann reaction in old and latent cases of syphilis is differently interpreted. Some believe it to be an enduring immunity reaction similar to the Widal reaction in typhoid fever cases, while others believe it to be a symptom of syphilitic disease needing treatment. The syphilis reagins, according to Wassermann and Citron, rapidly disappear from the blood in the absence of an exciting cause.

If the positive reaction is not an immunity reaction, then it can only be symptomatic of the disease, and this seems to be established beyond a doubt, since it becomes negative on intermittent treatment by mercury, which an immunity phenomenon would clearly not do.

The author lays stress upon the systematic and intermittent method of treatment by mercury as against the symptomatic method. In cases in which mercury does not produce the expected results, the fault must be looked for in conditions unfavorable to the absorption of the drug. The small cellular infiltrations accompanying the syphilitic process lead not only to local necrosis but also impede absorption, and these same conditions might serve to explain the existence of a negative reaction in cases of a localized malignant syphilis. The author explains on these grounds several observations that are met with in treating syphilis by mercury:

1. The dangers of too intensive a course of treatment. The blood is unable to transmit large amounts of mercury to the affected tissues, hence the nephritis, enteritis, and stomatitis following such treatment.
2. The fact that such cases are not attended by lasting results.
3. That the amount of mercury in the urine is no measure for the effect of a cure, nor has it any relation to the serum reaction.
4. The good results of the chronic treatment with doses of mercury that will not produce a dangerous accumulation of the metal in the circulation.

Although Gennerich believes in an energetic *ictus therapeuticus* in the beginning of treatment, he recommends the intermittent, not the continued, treatment, with very small doses of mercury, because the former gives the more enduring results. With regard to the irregu-

larity in the occurrence of variations of the serum reaction during treatment with mercury, the author believes that these may be explained by the above-mentioned general effects upon the organism of the drug. A very late positive variation of the serum reaction bespeaks a weak cure. A positive reaction following quickly upon treatment he explains by assuming that repair proceeds energetically and the cleavage products of degenerated tissues are thrown into the blood in great quantity, causing a stronger positive variation of the reaction. The view as regards to the origin of the reagines being the degenerated cell products finds an analogue in the occurrence of a positive reaction in consumptives, just before death, and in whom a similar tissue disintegration occurs at the terminal stage, as in syphilis.

The most approved drugs are calomel and gray-oil injections; the former is recommended as a first treatment, the latter for the intermittent treatment. Beginning with an injection of 0.06 to 0.07 of calomel every four days, the dose is decreased to 0.04 after the fifth or sixth injection. When the last injections had to be given to ambulatory, 0.11 gram of gray oil instead of calomel was administered. After seven weeks of such treatment and a pause of two months, another course of two months' treatment was begun in which 0.12 of gray oil were given weekly until 8 or 9 injections had been administered. Out of 1,500 courses of treatment, but two cases of albuminuria were noticed to occur.

Cases treated according to this plan from the beginning, generally, give a permanently negative reaction after two or three courses of treatment; secondary cases after four courses; older cases five to six courses.

In order to determine the existence of latent cases of syphilis, despite preceding treatment and a negative serum reaction, use is made of a provocative salvarsan injection which, in such cases, is followed by a positive variation of the serum reaction. A pause of six to eight months, after a course of insufficient treatment by mercury, is sufficiently long to give the reaction; the pause is slightly longer after treatment with both mercury and salvarsan; even after salvarsan alone was administered, the provocative reaction was produced. The intravenous injection of salvarsan is the best method of producing the reaction on account of the increase in reagines, following such injections, being greater than that by the subcutaneous or the intramuscular method.

The author expects that further observations by means of the above methods will result in the production of still more reliable data, summing up the results of his work in the following conclusions:

1. That the albumins of Winternitz, the precipitable globulins by the method of Klausner, Wassermann's reagines (ferments), and the cleavage products from syphilitic proliferations are identical substances.

2. That the reaction in every stage of syphilis is of great and far-reaching diagnostic importance.

3. Its variations follow a reasonable course; in conjunction with clinical experience and the late manifestations of the disease, the necessity for an intensive intermittent treatment by calomel and ol. cin. is clearly shown.

4. The reaction of Wassermann is of prognostic significance, since it enables us to diagnose latent syphilis through a provocative injection of salvarsan.

A large number of carefully completed tables show the individual cases treated by the various methods.

The above paper is the third part of what promises to be a most valuable series of contributions to naval sanitary science by the Medical Department of the Imperial German Navy.—(MEDICAL DIRECTOR H. G. BEYER.)

SEWALL, HENRY, Ph. D., M. D. Is there specific treatment for diabetes mellitus? The American Journal of the Medical Sciences, September, 1911.

Under this title the author gives an account of his experimental work on 12 cases of diabetes with partially digested muscle juice and extract of pancreas. He begins with the preliminary consideration that in spite of the accumulation of literature on diabetes, real advance in the knowledge of the disease demands still more facts.

Carbohydrate metabolism is considered in some detail:

All carbohydrates are absorbed as dextrose ($C_6H_{12}O_6$), and when stored in the tissues this is reduced to the less soluble glycogen, which is again converted into sugar preliminary to utilization. The carbohydrate molecule is essential to the metabolism of protoplasm, and when not available other foodstuffs, proteids, and perhaps fats undergo changes by which carbohydrate radicals are offered to the tissues. Sugar is said to be present in the normal blood in the proportion of 1 part to 1,000. When the proportion rises above 2 in 1,000, the kidneys become permeable and glycosuria results simply as the expression of excessive concentration in the blood.

The machinery which coordinates the metabolic activity of every living molecule with a varying supply of carbohydrate in the ration to the satisfaction of the tissues, while preventing an excess of sugar in the blood, is very complex. Carbohydrate in the body fulfills its function only in the molecules of living tissue, and the coordinate action of many individual organs and their products is necessary for its utilization, oxidation, and excretion; combined action on the part of the nervous system, liver protoplasm, pancreas, adrenal, thyroid, and other glands furnishing internal secretions.

The power possessed by the normal tissues of appropriating carbohydrate so as to prevent its accumulation in the circulation may be overcome by feeding excessive amounts of sugar. Temporary glycosuria can occur also as the result of temporary lapse of efficient function in one or another part of the elaborate and complicated nutritive machinery without involving any serious departure from the normal. "It is also to be expected that the mechanism for carbohydrate metabolism should at times suffer from permanent defects

in one or another of its parts, resulting in a more or less unmanageable tendency to the accumulation of sugar in the blood, thus giving rise to the pathological state known as diabetes mellitus." "The whole metabolism of the body may be modified in diabetes in a desperate effort to give the tissues the sugar food they are denied." The conclusion is that efficient treatment requires recognition and correction of the particular physiological function at fault, and this brings bewildering complexity into the practical consideration of diabetes.

It has been shown that the pancreas furnishes an internal secretion, probably formed in the islands of Langerhans, which is essential to normal carbohydrate metabolism. "The pancreas and the thyroid and the adrenals intensely inhibit one another, while the thyroid and the adrenals are mutually stimulant in the production of glycemia."

The active agents in the internal secretions of ductless glands are known as "hormones," which "Starling defines as chemical messengers, which, formed in one organ, travel in the blood stream to other organs in the body and effect correlation between the organ of origin and the other organs on which they exert their specific effect." Hormones are crystalloid, thermostable, and do not act as antigens when injected into animals. The hormone may act as a chemical stimulus to glandular activity or as an activator developing a latent property of a chemical body, converting a proferment into an active ferment.

In diabetes the cells of the body are probably incapable of preparing the sugar for oxidation. Modern observation tends to the conclusion that the functions long regarded as the criteria of life in protoplasm are carried on through the agency of enzymes or adventitious radicals which may join or separate from protoplasm without altering its integrity.

These ferments may bring about such chemical rearrangement without themselves being disorganized. They are essential agents in metabolism, and their action may be looked upon as a constitutional property of the living protoid molecule. This is in line with the modern theory of immunity where an adventitious side chain (complement) is assumed to correlate the reaction of tissue cell with antigen.

Muscle substance contains a glycolytic ferment, and Ransom concluded that a ferment could be prepared from frozen muscle capable of converting glucose or glycogen into lactic acid, CO_2 , and alcohol. Later investigations seem to show that a solution of glucose loses much of its reducing power when digested with a muscle-pancreas mixture, but that this is due rather to a concentration of the carbohydrate molecules into ozazones which do not reduce cupric oxide.

Upon reflection it seemed probable to the author that a vital link in the pathology of diabetes might be the lack of some tissue side chain or enzyme by means of which the tissue cells are alone enabled to appropriate the sugar in the blood. He turned to the skeletal muscles as the principal storehouse of this glycogenic or glycolytic ferment.

Method of preparing the beef juice.—One pound of lean beef is ground and covered in a jar with a pint of cold water, to which 30

drops of dilute hydrochloric acid are added. At times a quart of water and a drachm of the acid are used. The mixture stands in the ice box all night or at room temperature for four hours, and is then strained through cheesecloth. The liquid should be drunk during the course of the day, one-half to one tumblerful at a time. The meat residue should remain nearly dry and colorless. It is noted that this is essentially the beef soup long ago advised by S. Weir Mitchell in the treatment of neurasthenic cases.

The first six cases quoted were all beyond middle life. With allowance for the variations in the clinical course of diabetes and periods of amelioration under conditions not having specific relation to the pathological process, it is noted that four of the cases were refractory to ordinary treatment. Beef infusion was continued for from three weeks to several months. The urine of four patients became sugar free in from two days to two weeks; and in another case the percentage of sugar fell from 5 per cent on strict diet to 0.5 per cent in the course of three weeks, with rice and a teaspoonful of sugar in the diet each day. The remaining case regained her normal strength and energy which remained during about two months treatment, but glycosuria and acidosis were unrelieved, and the patient died about a year later in diabetic coma complicated with uremia. An attempt was made to continue the treatment with pancreatic extract combined with the beef, but the patient revolted against the unpalatable mixtures.

Continuing his work, the author assumed that the muscle enzyme needed, like the complement in the blood, an amboceptor to direct its energies, or like trypsinogen, an activator such as enterokinase to develop the ferment. He looked to the pancreas to furnish the intermediary body. In the last few years certain of the results of the administration of extracts of pancreas have been very encouraging.

The case of a girl, aged 7 years, is reported in detail, in which for a time extracts of muscle and pancreas had a coordinate action in abolishing glycosuria. She had had diabetes for about nine months when the course of experiments was begun. The patient's welfare did not suffer, as her tolerance for carbohydrates was *nil* at the beginning of the series, and about 3 ounces of bread could be consumed per diem toward the close of the experiments. At first the beef infusion was given daily with strict diet. The 24 hours' urine was occasionally sugar free, but it reappeared at once on the addition of an ounce of bread to the diet.

Then the administration of a pancreatic infusion was begun. "This was made by extracting about one-half pound of fresh beef pancreas with 1 pint of water acidulated with 30 drops of dilute hydrochloric acid." The urine immediately became sugar free. Experiments were then made to determine whether the beef and

pancreas infusions should be given together or in sequence; and if in sequence, which should be administered first. It was concluded in this case that neither the infusion of beef, beef-pancreas, nor pancreas when given alone was capable of abolishing glycosuria, but "It appeared from the last series of observations that an established glycosuria could be abolished by a sequence of mixed beef-pancreas infusion followed by pancreatic infusion, and that, moreover, the effect of treatment was to greatly increase the range of tolerance for carbohydrates." The mixed infusion was given one day and followed the next with the pancreatic infusion. Fresh pancreas is difficult to obtain and is most unpalatable. Commercial pancreatic powders were found to be unsatisfactory.

The patient appeared to be in the best state of well-being when the largest amount of carbohydrate within the limit of toleration was given. Gradually the limit of tolerance became restricted and the treatment was no longer effective. Three years later the 24 hours' urine contained 30 to 40 grams of glucose, a trace of albumin, and gave a strong reaction for acetone. There seems to be no doubt that the treatment effected an occasional abolishment of glycosuria. The possibility of the formation of an antienzyme as the result of the frequent administration of beef infusion is considered, but that does not seem consistent with the physiology of carnivorous animals.

The results of treatment were negative in six other cases of middle age or beyond.

The author concludes that in a certain proportion of diabetics beyond middle life the metabolism and general symptoms may be improved and sugar removed from the urine, at least temporarily, through the administration of the acidulated beef infusion. The treatment given in the single case of youthful diabetes seemed to improve the subjective condition.—(PASSED ASST. SURG. J. R. PHELPS.)

GOTTFIL, W. S., M. D. **Bromidrosis and hyperidrosis of the feet.** *Progressive Medicine*, September, 1911.

This subject is of interest to medical officers serving with troops. Merely mentioning the customary remedies used, cleanliness, frequent change of socks, the alcohols, formalin, salicylic acid, starch, alum, etc., Hale describes a method which he says is absolutely successful.

The patient, with all his footgear, is taken to the hospital. All his socks are soaked for an hour in 1 to 2,000 bichlorid solution, well rinsed three times in hot water, and then thoroughly washed. The entire insides of all his shoes are then painted with the following solution: Salicylic acid, 1 ounce; alcohol, 4 ounces. The feet are well washed, thoroughly dried, and are then painted with the same solution, special attention being paid to the interdigital clefts. The

entire cutaneous surface becomes white after the alcohol has evaporated. A pair of clean socks is then put on. The following morning the feet are repainted as before.

Two treatments are all that are necessary in ordinary cases. To maintain the feet in good condition, however, the patient must continue to pay attention to the cleanliness of the feet and his footgear. Patients are on the sick list but one day, and are instructed to report for observation in one week, or when any return of the symptoms appear. Hale believes in the theory of a specific germ for the disease, though he admits that uncleanness predisposes to it, and that individuals with flat foot are more prone to be affected than others.—(PASSED ASST. SURG. R. W. McDOWELL.)

SURGERY.

By SURG. R. SPEAR, United States Navy.

MARTIN, EDWARD. **The open treatment of transverse fracture of the femoral shaft.** Surgery, Gynecology, and Obstetrics, August, 1911.

This article deals with the open treatment of transverse or nearly transverse fractures of the shaft of the femur.

The indications for an operation are a failure to reduce the fracture under an anæsthetic or a failure to retain the fragments in their proper position after reduction. A complete and irremediable overriding, even if slight, is an indication for operation, provided the patient's general health is good.

The X ray should always be employed in the treatment of these fractures, and the responsibility of treating these fractures should not be entertained without its use if at all possible.

The prognosis of transverse fractures of the shaft is fairly good even under conservative treatment, complete overlapping does not prevent union taking place. The functional prognosis depends largely upon the age. The outlook in children is generally good; it is more or less bad in those past middle age. The prognosis of femoral fracture under conservative treatment is a source of anxiety always, as the mortality in these cases is 10 per cent.

The time for surgical intervention is as soon after the injury as the surgeon is assured that he can not reduce the fragments either by manipulation or by the application of splints and weights.

The operation is performed for the purpose of accurately approximating the fragments and securely holding them in position until union has taken place. Metal plates held by means of screws are better than silver cylinders or intramedullary bone contrivances. The plates should be strong enough to resist the action of the muscles; in

fact the whole success of the operation depends upon the strength and the fixation of the plate.

The plates are liable to break at the screw holes; they should therefore always be tested by the instrument maker. Lentz makes a plate reenforced at the screw holes of vanadium high-grade steel from the Carnegie Steel Co. This plate is more expensive than the stamped-out plates, but is much more satisfactory. It has been found that two screw holes on each side of the fracture are sufficient and that the screws need only perforate to the medullary canal. If the wound remains clean, the screws will remain for years in position and must be unscrewed if removal is desired.

Clamps (Lohman's), or Lentz's modification of the Lambotte instrument, should be used to approximate the bone fragments and hold the plates firmly while the screws are being put in place by means of a bone drill; the hole should be slightly larger than the core of the screw. (A 32 standard twist is the one usually employed.)

The less the bones are stripped of periosteum the better the healing will be; if manipulation, lateral traction applied to the lower fragments by means of a tape are unsuccessful traction with the flexed knee may be tried; or, if this fails, the broken ends can be delivered outside the wound, approximated, and then the limb can be straightened. If these procedures fail, a canvas band, sufficiently strong to stand a pull of 200 pounds, can be slipped over the upper end of the lower fragment and traction can be applied until the muscles relax; approximation is then easily accomplished. A weight of 100 pounds usually answers, but 200 pounds may be used.

The best retentive apparatus is a reenforced plaster-of-paris bandage, carried from the foot to the eighth rib.

The best incision to employ is at the outer border of the rectus muscle and through the crureus. The fingers should not be placed in the wound, as 60 per cent of the gloves are torn during the operation.

The author is not an enthusiastic advocate of the open method of treating fractures, either in this bone or other bones where a satisfactory apposition can be obtained by other means.—(R. S.)

YOUNG, HUGH H. *The cure of prostatic obstruction.* Surgery, Gynecology, and Obstetrics, September, 1911.

At first the author removed prostates by the suprapubic route, with a mortality of 10 per cent in 45 cases. He then tried the perineal enucleation, with suprapubic incision to push down the prostate. The Bottini operation was then employed in 85 cases, with a mortality of 7 per cent. This was given up, and the conservative operation by

the perineal route has reduced the mortality to 3 per cent and has been much more satisfactory in the end results than the other procedures.

In all 700 cases were reviewed. These include 5 cases in which a pedunculated median lobe was removed by the "cystoscopic rongeur" devised by the author.

The inverted V incision is used in practically all cases. The incision only goes through the skin and subcutaneous fascia, the tissues on each side of the central tendon, the space behind the perineal muscles and in front of the levator ani are opened up by blunt dissection. The bifid posterior retractor is now introduced, the central tendon is divided behind the bulb, and at once the membranous urethra is exposed behind the triangular ligament and opened on a staff for the introduction of the prostatic tractor. The great advantage of this route lies in the fact that the bulb is not injured and there is no injury to important muscular and sphincteric structures or the triangular ligament, and a splendid view of the operative field can be obtained.

In enucleating prostates Young finds the bilateral incisions preserve the floor of the urethra much more satisfactory than other incisions. After enucleating the lateral lobes the middle lobe can be easily pushed down on one side or the other. The finger can then be introduced into the bladder and vesical calculi or calculi from diverticula or other calculi projecting from a urethral opening can be removed.

A great advantage of the perineal route is also the fact that two extravescical cavities are left and hemorrhage can be easily controlled by gauze packing. The patients can also be gotten up in a chair on the second or third day, and the drainage is more efficient than that following prostatectomy by the suprapubic route.

In 482 cases in which the prostate was removed by the conservative perineal route there were 13 cases over 80 years of age, 75 cases over 75 years old, and 171 cases over 70 years of age. No case was refused on account of age.

In 18 cases the fistula closed during the first week after operation and 56 per cent of the cases had healed in less than 21 days. In only 14 per cent was the fistula present after the sixth week and in 27 cases only did the sinus remain longer than 3 months.

Convalescence is usually prompt. In only 4 cases was it necessary to continue the use of the catheter after operation, and these cases were of the small sclerotic type and are now treated by a partial prostatectomy or median bar excision.

As regards incontinence of urine after operation, there was no case of complete incontinence, dribbling day and night; there were, however, 3 cases in which the urine dribbled during the daytime. In

one of these cases the external sphincter was injured in exposing the prostate, but in the other two cases there is no such record. The preservation of the external sphincter is of the greatest importance; a careful dissection makes it easy to enter the membranous urethra behind.

If one is careful to divide the recto-urethralis muscle close to the membranous urethra and expose the anterior layer of Dénonvilliers's fascia at the apex of the prostate and carefully follow this fascia there is no danger of entering the rectum.

The author is of the opinion that the preservation of the floor of the urethra, ejaculatory ducts, and verumontanum have a distinct result in preserving the sexual powers, and also suppurative epididymitis is much less frequent.

In determining whether a prostatectomy can be done safely the most important information is as to the functional capacity of the kidneys. The phenolsulphonaphthalein test has been of great value. An intramuscular injection of 1 cubic centimeter of fluid containing 6 milligrams of the drug appears in the urine within 5 to 8 minutes and in normal cases can be determined by its red color. Within 2 hours 75 per cent of the drug should be secreted and the amount can be accurately determined by the Dubosq colorimeter or the Helig hemoglobinometer. The drug is eliminated entirely through the kidneys, and when these are diseased the appearance time is much lengthened and the total output per cent for 2 hours is diminished. In all patients where this test shows kidney involvement preliminary treatment is carried out to improve the condition before operation is undertaken.

Note is made of the frequency of carcinoma in enlarged prostates. One case in five of prostatic enlargement in old men in Young's clinic shows this condition to be present. An early diagnosis and a radical operation have been responsible for a large percentage of cures.

In cases that present merely a median prostatic bar or wounded lobule associated with a moderate amount of residual urine, the author uses his "urethroscopic median bar excisor" or "punch." The operation is generally performed under cocaine; the bladder is drained by a two-way catheter for 24 to 48 hours. Twenty cases have been operated upon by this method with excellent results.—(R. S.)

ZUR VERTH, Dr. Marine-Oberstabsarzt. **The organization of the medical service at the main dressing station in battle.** Marine-Rundschau, March, 1911, p. 349.

Dr. zur Verth is under the impression that neither the Spanish-American nor the Russo-Japanese War has bequeathed the medical branch of the naval service material sufficient to serve as a reliable

guide in the preparation for a future war between ships that are more nearly equal in guns, armaments, and men than were those engaged in the last two naval conflicts. In the last naval war the Russians, with a few noble exceptions, stood the test badly, while the Japanese had a too easy time of it. He regrets the lack of published information on the results obtained by the Japanese, a debt which they still owe the civilized world.

For the main dressing station on battleships, to which his remarks are limited, the principles laid down by von Bergmann for the field dressing stations would still apply with equal force: Its organization, disposition of surgeons, the sorting out of the wounded are the essential conditions upon which the life-saving functions of this station depend. The great prevalence of wounded, due to artillery fire, would increase the relative number of the seriously wounded on board ship as compared with battles on land; to this must be added the comparatively small number of surgeons on ships. On the other hand, there are favorable conditions at sea which neutralize to some extent these unfavorable ones. It is easier on board ship to keep the surface of the body as well as the clothes cleaner than it is on land; the time it takes for the wounded to reach medical attendance is shorter; their transport is less likely to add insult to injury; the facilities for a thorough examination and treatment are greater and less dependent on local conditions; finally, after being dressed, their further transport by water is attended with less danger than that by land on account of the greater ease of medical supervision in a seaway than during transportation by land.

The regulation of January 27, 1907, divides the main dressing station in the Imperial German Navy into two sections: (1) The receiving station and (2) the dressing station proper. The function of the first is the sorting out of the wounded as they arrive in (*a*) walking patients (white tags); (*b*) wounded, able to be transported, but in need of hospital treatment (white tag with one red line on the long side of the tag); (*c*) wounded, not transportable; abdominal wounds (white tag with two red lines on each long side). Slightly wounded may be treated at the receiving section. Wounded, liable to die any moment, are laid away in a place reserved for them. All others needing immediate, careful surgical attendance are passed on to the surgical dressing station proper. The surgical dressing section proper has the function of preparing the wounded for a safe transportation by putting on permanent dressings and performing life-saving operations. The importance of seeing to it that every patient thus treated is brought under a permanent roof is not to be lost sight of.

In case there are but few wounded, both the surgeon and assistant surgeon will give them their combined attention; in case of many

wounded arriving, a division of the work on the principle of a receiving and a dressing section will be necessary. The surgeon will attend to the seriously wounded, the assistant to the less seriously wounded. In case of a sudden increase of seriously wounded, they must be laid aside in a neighboring room.

Without a division into sections, each with a different function, and assuming that both surgeons attend to the wounded as well and as quickly as they can, the care will be done in accordance with the time of arrival of the wounded and not in accordance with the serious nature of the cases. Without such a division of duty, a just and proper attention to patients is impossible. The inevitable consequence would be that some, whom prompt assistance would have saved, would die while the surgeons are attending to others in less serious condition, and, since the probability of wounded arriving in large numbers is very great, a division of the hospital corps men into sections, according to the above-mentioned principle, is advisable, in order to prevent unnecessary losses.

The surgeon must have at least one assistant; when but two medical officers are on board, one of the hospital stewards must serve as such. The hospital apprentice, besides giving the anæsthetic, must assist in keeping order. The ship's paymaster is to serve in the capacity of writer.

At the receiving station the assistant surgeon is aided by two men carrying the more seriously wounded to the main dressing station; here one of the carriers assists in the administration of the anæsthetic, two others help the surgeon, two more remove the ones attended to to a place of safety.

To sum up: The receiving station must have one medical officer, two carriers as aids, two carriers for transport; the main dressing station must have one surgeon, one assistant (either assistant surgeon or hospital steward), one anæsthetizer, with aid (apprentice or carrier), two additional carriers as helpers, two carriers for transporting; two writers (paymaster and clerk).

zur Verth very aptly remarks at the end of his valuable paper that in no other branch of the service is it so difficult to harmonize peace drills with the fearful earnestness of actual conditions, and that war alone can give to such drills their profound and true significance; that, on the other hand, only those who have thoughtfully anticipated and are prepared to meet the conditions as they are most likely to be, will meet no surprises.—(MEDICAL DIRECTOR H. G. BEYER.)

HYGIENE AND SANITATION.

Medical Director H. G. BEYER and Surg. C. N. FISKE, United States Navy.

LANGWORTHY, C. F. (United States Department of Agriculture.) **A strength and endurance test.** Science, Vol. XXXIII, No. 853, p. 708, May 5, 1911.

The test consisted in walking with a 100-pound sack of sand on the back for $9\frac{3}{4}$ miles on the comparatively level streets of Kankakee, Ill. The 48 contestants started at 2 p. m. and only 6 completed the 12 laps of the course, which required about 4 hours. The first lap was accomplished by 44, the second by 25, the third by 22, the fourth by 19, the fifth by 15, the sixth by 13, the seventh by 11, the eighth by 10, the ninth by 9, the tenth by 8, and the last 2 laps by 6. The ages and weight of 4 of the successful walkers were, respectively, as follows: 24 years, 54 kilograms; 40 years, 116 kilograms; 52 years, 82 kilograms; 21 years, 68 kilograms. Upon inquiry, the youngest man was found to be a moderate eater, while the other three considered themselves hearty eaters. Mixed diet seemed to be the rule; three did not use cereal breakfast foods, two neither tea nor coffee, and one no tea. None appeared to be athletes, but all were accustomed to a certain amount of physical labor.

In the test Langworthy estimates from the Zuntz-Schumburg formulæ the average expenditure of the successful contestants as from 1,137 to 1,706 calories, depending upon a necessary allowance for climbing a 9 per cent grade on one of the streets. The four hours' work seemed to be in excess of the 1,200 calories generally figured to cover the work of a mason or carpenter.

While loath to draw sweeping deductions, the author believes "that the men who engaged in the contest were, as regards their food, their occupation, and their general living conditions, representative of the very large group of our population who are living comfortably and meeting their daily obligations in a creditable manner; who are, in fact, living the average life of the average man * * * capable of meeting body demands of considerable severity * * *"

[The Medical Record, in its leading editorial of August 12, 1911, seems to find a lesson in the above test, namely, "the advantage of avoiding athletics." It even goes so far as to suggest that "this test should be seriously considered by those athletic enthusiasts of our Army and Navy who seem to think that marching ability is not possible without strenuous training. So many contend that such exercises reduce endurance that we would suggest, in the interests of military efficiency, that the matter be tried out. Let two or three regiments be given only as light drills and exercises as the grocery clerk, and be never fatigued. Let two or three others be given a severe course of training with frequent practice marches heavily

loaded. Then, after a year, say, compare their ability to cover 200 miles. The Kankakee test would indicate that the former would be the better marchers."—(C. N. F.)

KORFF-PETERSEN, ARTH. *Gesundheitsgefährdung durch die Auspuffgase der Automobile.* (Dangers to Health in the Gases from Automobile-engines.) *Zeitschr. f. Hygiene u. Infektionskr.* 69 Bd. 1. Heft, 1911.

The enormous increase in automobiles has completely changed the street picture in most all our larger cities in recent years. The great advantages which the motor car offers to traffic are more than counterbalanced through certain hygienic objections which attend their general use, consisting in both a dust and a gas nuisance. Even a walk into the suburbs of large towns has ceased to be a recreation, since the gas-filled atmosphere makes deep breathing undesirable.

The incompleteness of the combustion in the motor gives rise to methane, acetylene, and carbon monoxide. In London policemen have been taken sick with carbon-monoxide poisoning. The bluish-gray cloud which is left in the rear of the automobile was found to consist, in the first place, of a considerable quantity of watery vapor, soot, and grease, all of which are visible. The invisible gases consist of nitrogen 85 per cent, carbon dioxide 4.9 per cent, oxygen 5.3 per cent, carbon monoxide 3.7 per cent. To this must be added methane, heavy hydrocarbons, hydrogen, and aldehyde substances, which latter give these gases their peculiar odor. The greater the speed the higher the percentage of carbon monoxide, which may reach 7 per cent (Clerk). The undiluted gas kills mice in less than one minute, under convulsions. Guinea pigs and even rabbits die in short time, likewise in convulsions, and carbon monoxide was found in their blood. That carbon monoxide is the most dangerous constituent of these gases was proven experimentally. After conducting the gases through defibrinated blood a mouse exposed to them was still alive at the end of three-fourths of an hour. Even if such gases are at once largely diluted, it must be remembered that a concentration of CO of 0.5 per cent is still dangerous. Passengers in the motor busses have been known to suffer from headaches and nausea. In such cases the odor no doubt shared in the production of the illness.

In order to determine the nature of the odoriferous substances, the gases were passed through water and alcohol, the rest of the gases, outside of CO₂, not being very soluble in these. Both water and alcohol assumed the well-known odors. The water reacted slightly acid, reduced ammoniacal silver-nitrate solution, and gave red color with sulphurous-acid fuchsin, showing that these odoriferous substances consisted of a mixture of different aldehydes, among which

acrolein is perhaps the most prominent, as was shown by the blue reaction obtained on a porcelain plate in a mixture of a drop of piperidin and a drop of sodium nitroprussid when exposed to these gases.

These odoriferous substances, when removed from their solutions by a current of air, caused in the animals exposed to them difficulties in breathing and in some even paralytic symptoms. These gases originate in the lubricating oils.

Insufficient lubrication of the motors, some of which make 1,000 revolutions per minute, is sometimes the cause of the trouble. Carbon monoxid originates from an incomplete combustion of benzine. Of the greatest importance is the gas producer. The mixture of air and gas must be such that a complete oxidation, with every speed and under every charge of the motor, is brought about. The production of such a gas producer is a matter of great difficulty, although constituting the only remedy and uniting in itself both hygienic and economical advantages.

A good benzine is essential. Its specific gravity must be between 675 and 720. Heavier benzines must be avoided. While the prevention of CO is a matter of great technical difficulty, soot and bad-smelling substances are much more easily prevented. Too much oil in the cylinders is a frequent cause. Automatic lubricators ought to take the place of hand lubricators. The motor must be in good working order and tight.

Of all the remedies suggested the best is to so prepare the material of combustion as to insure a complete oxidation. Mr. Paul Suchy proposes to remove from it all unsaturated hydrocarbons and saturate the benzine with oxygen. His experiments have not yet been completed. In the meantime it will be of the greatest advantage to pay attention to three important points, namely, (1) an efficient gas production, (2) a good quality of benzine, (3) a faultless lubrication.—(H. G. B.)

SPÄT, Dr. WILHELM, K. K. Regimentsarzt. **On the Decomposing Power of Bacteria in Water.** Arch. f. Hygiene, 1911, Bd. 74, Heft 6, pp. 237-288.

It must perhaps be admitted that the extravagant hopes placed on the bacteriological examination of a water as the exclusive method to determine its safety and potability have not been realized. Some investigators even look upon the search for pathogenic bacteria in any water as a waste of time. We must therefore welcome any other method, no matter how indirect, which is calculated to point out an infected water in less time than it takes to prove the existence in it of definite pathogenic germs.

Spät, in a very thorough experimental research, has investigated the decomposing power of such bacteria in a water that are derived

from soil contamination into which, in the natural course of events, infected material finds its way. By determining the amount of ammonia in such water he finds a measure for the quantitative contamination of such water by soil bacteria.

His conclusions are, briefly, as follows: In sterile waters no ammonia could be found; in waters poor in bacteria the quantities of ammonia were slight; in waters rich in bacteria and at the same time unclean the ammonia reached considerable proportions.

Neither pathogenic nor the so-called water bacteria possess any great decomposing power, while that power was very great on the part of those bacteria that were derived from the soil.

When the ammonia content of a water exceeds an amount equal to 5 c. c. of $\frac{N}{100}$ NaOH solution a contamination by surface water is to be looked for. A sudden rise in ammonia in a well water, for instance, is a sure sign of a fresh contamination of it by a soil-polluted surface water.

Sewage is attended by the formation of large quantities of ammonia and proportionate to the degree of contamination. The smallest quantity of sewage still able to form ammonia might be used as a criterion for the degree of contamination. Spät was able to prove the presence of ammonia in 0.0005 cubic centimeters of sewage in a sediment tank.—(H. G. B.)

TRAPANI, DR. P., Lt. Col. Royal Navy. **An epidemic due to a probable infection by the Gärtner bacillus.** *Annali di Medicina Navale e Coloniale*, Anno XVII, 1911, Vol. I, Fasc. I, p. 36.

The epidemic described occurred on board the *Bronte*, 11 days after leaving Buenos Aires, affecting 30 patients in all. The patients all complained of heaviness in the head, a dry, bitter taste in the mouth, a great desire for sleep. During the first 24 hours after the onset of the disease the chief symptoms were intense headache, chilly sensations, great pain in the lumbar region, radiating toward the abdomen, temperature from 38.2° to 41° C., accompanied by malaise, loss of appetite, vague pains in the muscles, in bones, and joints, nausea, and vomiting (in about one-third of the cases) of bile-colored undigested food. The stools were loose; in two cases there was pronounced diarrhea. In some cases there was mental depression, in others excitement with delirium. The epidemic was traced with great care and found to be due to canned meat, served out on the morning of the day on which the outbreak occurred. Defervescence occurred after the fifth day of the disease, the temperature fell by crisis, all the symptoms gradually disappeared, and two weeks after the onset every patient had recovered and was doing duty.

After carefully eliminating every possible other disease and every probable etiological cause of it, an infection of the meat by the Gärtner bacillus proved to be the most probable etiological factor in the causation of the epidemic.—(H. G. B.)

BECKLER, E. A., and DUSOSSOIT, D. J. **A bacteriological investigation of commercial ice cream in the city of Boston.** Jour. Am. Pub. Health Assn., Vol. I, No. 8, August, 1911.

During six months 103 samples were obtained from manufacturers and stores, 73 of which gave bacterial counts from 2,000,000 to 25,000,000 per cubic centimeter; 12 gave counts below 500,000, the lawful limit. Nearly 20 per cent showed gas-producing organisms in 0.01 c. c. of the sample. Streptococci were found by culture in 82 per cent. These findings are attributed to the cream used in manufacture.

Experimentally, from four samples of cream showing from 990,000 to 4,000,000 organisms, ice cream carefully made by the investigators showed in three instances a reduced count of from 30 to 70 per cent and in one instance an increased count of 75 per cent.

Storage of the product showed marked increase in bacteria beginning after six or more days. Unless exceptionally good cream or pasteurization is available the careful manufacturer can not be expected "to produce ice cream with a bacterial content within the legal limit."—(C. N. F.)

HART, W. H., Maj. (Medical Corps) United States Army. **Emergency rations.** Jour. Milit. Service Inst., No. CLXXIII, September-October, 1911.

In view of the fact that the United States is a great producer of foods, with unlimited resources and transportation facilities, Hart questions the practical necessity for the soldier's continually burdening his pack with "a little tin of unfamiliar food mixture" in the shape of the emergency (condensed) ration now required. No great objection is had to the storing of these rations in warehouses if really necessary. In the discussion, "J. N. A." doubts if the ration would, after a practical test, receive the same commendation which was given by a division commander during a three days' riding test.—(C. N. F.)

OUDARD, DR., Med. 1^{re} Cl. de la Marine. **Accidents de décompression.** Arch. de Méd. et Pharm. Nav., Tome XCVI, No. 7, July, 1911.

After reviewing the meager French literature on caisson disease and the autopsy reports of Zografidi and Paul Bert, the post-mortem report of M. M. Pervès and Oudard is given, which may be briefed

as follows: A tunnel worker, aged 28 years, and of vigorous constitution, entered a caisson for the first time to the depth of 17 meters, and worked eight hours, during which time he experienced no discomfort. Ten minutes after a 10-minute decompression (pressure and depth not stated) serious symptoms developed, which caused him to be sent to the hospital, death occurring in the ambulance about an hour after decompression. Autopsy 64 hours after death showed moderate rigor mortis and a rose-blue cyanosis of face and thorax. The heart was evidently dilated, pericardium bulging and displacing the lung; palpitation of heart gave a sensation of soft fluctuation like a balloon half filled with air. Upon incision, under water, large bubbles of gas escaped from right and left ventricles.

Innumerable bubbles of gas were strikingly evident in all intra-abdominal blood vessels as well as femoral and iliac arteries and veins, aorta, and inferior vena cava, giving the appearance of "broken alcohol columns of thermometers" or of "pearls," which would move under the fingers. The mediastinal cellular tissue, lung surfaces, and gastro-hepatic omentum exhibited a frothy appearance. The liver showed innumerable gas bubbles on section; the deep-red lungs appeared congested, emphysematous and contained more bubbles and serum than normally, and of course floated. Coronary arteries were distended with gas bubbles. The pia mater was congested, especially at fissure of Rolando and perforated spaces, and its vessels contained gas bubbles; the white matter and central nuclei of brain appeared exsanguinated, while the ventricles held a sero-sanguilant liquid without clots or gas.

The spinal cord was macroscopically normal except for gas bubbles in its vessels:

Summary.—This observation confirms the hypothesis of P. Bert. Rapid decompression is attended by a gaseous dissociation in all parts of the body; death occurs by a sudden arrest of the circulation by a generalized sectioning of the blood mass.

Gas is found in every organ, especially where there is blood. Venous and arterial systems are equally the seat of gas embolism. Right and left sides of the heart are equally dilated by gas. (Silberstein found air only in the right ventricle.)

The condition of the lungs is particularly interesting. At first sight they have the appearance of congestion, but their consistence is nearly normal; crepitation under the fingers is as distinct as in the ordinary state, and they float like healthy lungs. The sero-sanguilant liquid which escapes upon section is particularly aerated.

In our opinion, this condition of the lungs should not be confounded with ordinary pulmonary congestion. The special histological structure of the organ, the enormous distention of the capillaries, and the delicate alveolar tissue appear to explain the lesion. This fragile tissue has been not only distended but lacerated and ground by the gas [which, like the gas from the heart, upon analysis appeared to be 90 per cent nitrogen].

Circumstances did not permit us to verify histologically this hypothesis inspired by macroscopic appearance. Such histological study appears never to have been undertaken; at least we have no indication of it in the course of our lectures.

As for the emphysematous appearance observed on the lung borders, it is explained, perhaps, by the fact that the dilation of the alveoli has been able to proceed freely in the neighborhood of the cul-de-sac and pleural sinus.

We have noted that certain areas of reflected peritoneum were in some way insufflated. This particular condition can doubtless be likened to the little gaseous tumors noted by most writers in the thick subcutaneous tissue, gaseous tumors accompanied by those painful prickings which observers call "fleas."

We have in no wise noted hemorrhages macroscopically, contrary to certain observations [of Zografidi, of le Roy de Mericourt, and of Michel].

At the time of this rapid death we were able to question a professional worker who had descended caissons for 20 years, had known and directed some thousands of workers. During this time he noted only six deaths from "coup de décompression," in which not one was a case of rapid death; the deaths in all cases occurred after one or several weeks [paralytic form].

In order to obviate serious accidents, recompression is the treatment of choice and gives great success. The workers submit to it voluntarily. But they have, perhaps, greater confidence in energetic rubbings of the region attacked, rubbings which result favorably when the gas dissociation occurs in a superficial vascular region. Many benign attacks are quickly relieved by this proceeding, which is commonly employed by workers in all cases, whether alone or combined with decompression.---(C. N. F.)

CHITTENDEN, R. H., Dr. The merits of a relatively low protein diet. British Med. Jour., September 23, 1911.

In his paper opening the discussion on the subject before the section of therapeutics, including dietetics, of the British Medical Association, Chittenden makes a long and strong plea for the acceptance of scientific observations as compared with "the orthodox physiological faith" and generalized impressions and assumptions, such as dietary standards adopted by a people, "must be right because they represent their food habits * * * which have had general acceptance for many years."

In harmony with the views of Crichton-Browne, one of his chief critics, in *Parsimony in Nutrition*, the author emphasizes the fundamental proposition, "the quantity of food consumed daily should be proportional to the needs of the body * * * to repair tissue waste and to furnish fuel for heat and work * * * that any excess or deficiency in the quantity of food is liable to be followed by more or less disastrous results." The determination of the physiological needs is held to be of vast importance to the maintenance of health, strength, capacity for work, and, in short, the efficiency of the individual and the race, and it is a scientific problem to be solved by scientific methods of study.

The protein requirement to which Chittenden has confined his study is a constant for the individual and depends upon the weight of the protein-containing tissues of the body, whose waste it is its sole function to replace; energy requirements are satisfied by the nonnitrogenous foods and must, of course, depend upon variation in body activity. Tissue waste is measured by the amount of nitrogen excreted by the kidneys except in the overingestion of protein, when the excess, not being retainable in the tissues, must be excreted through the urine, and represent food-waste and unnecessary excretory labor on the part of the organism.

The Voit or Atwater protein standards, 118 and 125 grams, respectively, signify to Crichton-Browne limits which must at least be attained, while Chittenden, from his earlier experiments, interprets them as limits which should not even be approached; in the latter's opinion 0.85 gram per kilogram of body weight, or 60 grams for a person weighing 154 pounds, should give a safe margin for lack of availability, digestibility, and personal idiosyncrasy.

There is no ground for supposing that the protein molecule is needed for its carbon content, and the argument that its stimulating action is required for increasing ingestion of food in general "stands opposed to physiological good sense." Protein used as a source of energy involves the disposal of complex waste products which must have some different effect upon the body than does the carbon dioxide and water which remains after tissue fat and glycogen (complete oxidation) have been elaborated from nonnitrogenous foods.

Subsequent to his noted experiments with 24 men, reported in 1904, the author has come to the conclusion that many healthy energetic men in comfortable or affluent circumstances actually and habitually do maintain body vigor with a nitrogen metabolism far below that called for by the standard dietaries. To satisfy himself on this question Chittenden quantitated the urinary nitrogen of 108 average healthy university students selected at random and found that with an average weight of 66.2 kilograms the average nitrogen excretion was but 12.87 grams, only 80 per cent of what would have been excreted had the Voit standard of 118 grams been followed. Of those 108 individuals 36, whose weights varied from 45 to 83.3 kilograms, averaged to excrete 9.27 grams of metabolized nitrogen daily. This corresponds to 58 grams of protein metabolized and 68 grams ingested. It so happens that the man weighing 83.3 kilograms showed, with three exceptions, the lowest figure for metabolized nitrogen 0.123 gram per kilogram of body weight. If food habits are to be assumed to represent body needs, these active and in many instances athletic men may be believed to have unconsciously shown that need for protein to be not far above that computed by the author in his earlier investigations.

Daily analyses of food ingested and feces and urine excreted by six laboratory workers, from 21 to 29 years of age and weighing from 51 to 70 kilograms throughout a period of 130 days, showed that weight was gained, there was a plus nitrogen balance, a nitrogen utilization percentage of 88 to 90, a fat utilization percentage of 88 to 90 (indicating absolutely no disturbance of digestion in spite of a relatively large ingestion of fats and carbohydrates), and if anything an improvement in health (as observed by an unprejudiced medical examiner), all this on a protein intake of little over 70 grams. The average fuel value of ingested food ranged from 2,750 to 3,650 calories.

The dietaries of various institutions where heavy work is performed and good health maintained, but where the protein intake averages below 80 grams, are adduced in further corroboration of the above observation.

The unfavorable interpretations generally made following McCay's investigations upon the people of Bengal are readily explained by quotations from McCay's report,—it was the character of the food which caused over 25 per cent of the total nitrogen ingested to be lost in the feces and the resulting fermentation and putrefaction rather than the low protein itself which accounted for deficiency in musculature, blood, and bodily development.

The amount of protein required to build the tissues of an infant or of a growing child is obviously an entirely different matter, and Crichton-Browne's comparison therein befogs the issue. As a matter of fact, Rubner has shown that but 5 per cent of the calories of a suckling infant is derived from protein, and this, translated into calories required by a man weighing 70 kilograms, would indicate but 31.4 grams of protein to be metabolized.

Conclusions from the lengthy paper are so obvious as to render quotations unnecessary, but it should be admitted that they failed to convince the majority of noted workers who participated in the discussion either of their soundness or of their practicability.—(C. N. F.)

WEICHARDT, W., Prof. Dr. Über Eiweißspaltprodukte in der Ausatemluft. Archiv. für Hygiene, Band 74, Heft 5, 1911.

The Flügge school demonstrated the projection of minute particles such as bacteria in forced expiration; by anaphylactic tests, complex active organic substances have been interpreted in respiratory vapor and droplets; toxic fermentation (albumin-cleavage) products are shown by similar tests, even quantitatively, to arise from the mucous and respired air, particularly of aged, fatigued, and asthmatic persons.

In his present paper Weichardt criticizes at length the conflicting results reported by Dr. R. Inaba, of Japan (*Zeitschrift f. Hygiene u. Infektionskrankheiten*, Bd. 68, S. 1), from the latter's intravenous inoculation of unconcentrated (anisotonic solution of) expiratory vapor, experiments carried out alone since his association with Weichardt in his earlier and well-known investigations on "kenotoxin." Objection is had to Inaba's interpretation that toxic effects after intravenous injection of condensed respiratory vapor are due to their anisotonicity, because Weichardt always insisted upon concentration in vacuum to an isotonic solution which subcutaneously produces such characteristic toxic effects as could not follow the injection of merely anisotonic and otherwise inert liquids. Moreover, the intravenous injection of distilled water tends to produce a rise of temperature rather than the fall which Inaba reported as corresponding to one of Weichardt's observations. Weichardt concentrates the respiratory vapor from 15 cubic centimeters to 25 cubic centimeters and injects a 10 to 12 gram mouse subcutaneously, observing a fall in temperature; a subsequent similar injection produces coma and dyspnoea of higher grade, while the control mouse injected each time with physiological salt solution remains lively. Repeated injections of distilled water may produce trivial toxic effects but in no way comparable to those of complex chemical substances.

Furthermore, if respired and, so far as possible, residual air from a fatigued person of 60 years be drawn for 2 or 3 hours through 10 cubic centimeters of distilled water to which had been added 0.30 cubic centimeter of normal salt solution and the solution be concentrated in a vacuum to 2 cubic centimeters, neutralized with NaOH and divided into 2 portions (now isotonic), two mice may be experimented with, as follows:

Injecting, at once, the first mouse with one of the above portions (1 cubic centimeter) produces the characteristic toxic phenomena. The second portion, however, one dilutes to 10 cubic centimeters and attenuates by boiling to dryness to inactivate the toxin, after which the residue is dissolved in 1 cubic centimeter of distilled water and injected into the second mouse, which will show no toxic symptoms; the first mouse has been sensitized, as may be shown by further injection, while the second has not.

The present paper adduces further proof that "breath water" is not chemically equivalent to distilled water and records the weighing to a constant of residues from evaporation of equal quantities of distilled water, which naturally was 0, and of respiratory aerated water (as made in the above experiment), which showed 0.009 gram.

This residue gives off characteristic smoky odors of organic matter upon incineration or upon acidifying with HCl after being made alkaline with NaOH.

The guaiac reaction (blue color) fails to appear when a sufficient amount of protein cleavage product ("breath water") has been added to a fixed quantity of such a catalytic as a very dilute solution of fresh hemaglobin, using the guaiac indicator; the determination is made in parallel series of test tubes, using normal salt solution as a control in place of the "breath water" which destroys the activity of the catalyzer.

The same organic substance has been obtained from respiratory vapor condensed on stone plates covered with finely divided CaCl_2 , exposed overnight in a crowded sleeping room; the condensed vapor (deliquescence) was taken up on blotting paper and the presence of albuminous substances are definitely and "once for all" proven by guaiac and other reactions.

[On account of the long unsatisfactorily answered question, What chemical constituent or physical state accounts for the deleterious action of vitiated air? Rosenau and Amoss, of Harvard, have recently (*Jour. Med. Research*, xxv, 35, 1911) conducted anaphylactic experiments which tend to show that protein is to be found in expired air, independent of droplets, which observation at once opens up another large subject, namely, the volatile state of or gaseous solution of protein.]—(C. N. F.)

LEDERER, ARTHUR, M. D. The influence of storage and various preservatives upon the dissolved oxygen in waters. *Jour. Am. Pub. Health Assn.*, Vol. I, No. 10, October, 1911.

In his paper before the laboratory section of the association Lederer showed that all waters lose a proportion of their dissolved oxygen, depending upon degree of pollution and the temperature and length of time between collection of sample and its analysis; the purer the water the more stable is its dissolved oxygen; hence the importance of either determining the oxygen content at once, which may be inconvenient or impossible at place of collection, or of preserving the water from bacterial activity until analysis is practicable. The standard American Public Health Association method (Winkler) was used throughout. The following conclusions were drawn:

First. The percentage reduction of dissolved oxygen in waters which are stored in tightly closed bottles and exposed to a constant temperature for a definite length of time constitutes a fair index of pollution.

Second. To unpreserved samples of polluted waters the reagents for the determination of the dissolved oxygen must be added on the spot to avoid a reduction. In a pure water, such as that of Lake Michigan, if stored at a low temperature the samples can be kept for a few hours without material reduction.

Third. The addition of 1 cubic centimeter of 40 per cent formaldehyde solution to a sample of water, even if badly polluted, will preserve the amount of dis-

solved oxygen present for at least two days at 22° C. storage and for at least four days at 10° C. storage.

Fourth. If kept in a dark place a sample of water taken under the necessary precautions to avoid aeration can be preserved with formaldehyde for a reasonable length of time and shipped to a laboratory without danger. Thus no field apparatus except the device for taking the sample and a bottle of formaldehyde is required. In calculating the final result a correction must be made for the amount of sample displaced by the addition of the preservative.

Other preservatives, such as chloroform, thymol, alcohol, trikresol, and phenol, were found to be inefficient or wholly unsuited for the purpose.—(C. N. F.)

STILES, GEO. W., M. D., Ph. D. The bacteriological examinations of shucked and shell oysters. Jour. Am. Pub. Health Assn., Vol. I, No. 9, September, 1911.

As a result of an extended bacteriological study made in connection with that of the Bureau of Chemistry of the Department of Agriculture and at the request of the North American Oyster Growers and Dealers' Association, the following conclusions were reached:

Shucked oysters as ordinarily found on the market contain more bacteria per given volume of liquor than oysters opened directly from the shell under clean conditions.

The bacterial content of opened market oysters may include numerous colon bacilli and streptococci. Each of these organisms is not only evidence of fecal contamination, but to my mind, when present in such large numbers as indicated in Table No. 3, their toxins may cause gastrointestinal derangements of a serious nature if consumed raw by susceptible individuals.

Oysters may be grown on pure grounds and remain in good condition while in the shell, but because of unclean methods of shucking and handling they may be subsequently contaminated and rendered unfit for food.

There is no assurance that shucked market oysters are always cooked before consumption. They may be served raw on old shells, in the form of cocktails, on plates, or in some other manner.

Oysters intended for human consumption should be grown in water free from pollution, and the greatest care should be exercised to keep such a product in a clean and wholesome condition until consumed.—(C. N. F.)

TROPICAL MEDICINE.

By Medical Inspector E. R. STITT, United States Navy.

JAMES, W. M. A preliminary report on a method for preventing the development of pernicious malaria. Journal of Tropical Medicine and Hygiene, November 1, 1911.

James states that the presence of very many young ring forms, the occurrence of segmenting bodies, and a large proportion of infected red cells is an indication of perniciousness. He notes that the older parasites which block the capillaries in estivo-autumnal fever are not amenable to quinine as ordinarily given.

He considers that an infection of 5 per cent of the red cells is a sign pointing to perniciousness, and this is true in marked degree if about 1 in 20 of these infected erythrocytes show more than one parasite.

He thinks a fatal issue may result from: (1) The blocking of the capillaries of vital organs; (2) from continuous liberation of toxin; (3) from a combination of these two methods; and (4) from failure in elimination of the toxin.

It is stated that the comatose pernicious malaria is especially dangerous. Here, from injury to centers governing respiratory and cardiac action, we get a clinical picture similar to that in fatal pneumonia.

He makes the statement that red cells containing young schizonts do not plug the capillaries, but only those containing more mature rings. Furthermore, that red cells containing schizonts that have been damaged by quinine do not seem to have the faculty of plugging capillaries.

Again, such damaged parasites do not seem to sporulate simultaneously, but the process extends over a period of a day or more, thus giving the patient an opportunity to eliminate the toxin.

The question of how best to counteract perniciousness by subjecting the parasites to quinine is next taken up, and the statement is made that the ordinary method of giving quinine subcutaneously in 1:2 or 1:3 dilution is the one by which absorption of the drug takes place most slowly.

He considers Bacelli's method of giving quinine intravenously in 1 to 10 dilution dangerous and unsatisfactory.

The experiments of Capt. MacGilchrist are quoted to show that 1 to 100 solutions of quinine salts are not miscible with blood serum and that the bihydrobromide even in 1 to 20 solution forms a curdy mass when mixed with an equal amount of blood serum. In intramuscular injections as ordinarily given the quinine is precipitated out at the site where deposited.

Animal experimentation shows that quinine is most readily absorbed in the following order: (1) Subcutaneous injection in great dilution (1 to 150); (2) by mouth when fasting; (3) by mouth with food; (4) subcutaneous injection as ordinarily practiced (1 to 2 and 1 to 8). MacGilchrist states that extreme dilution must be obtained when quinine is given intravenously (he gives 7 grains of bihydrochlorid in about 2 pints of salt solution). A dilution stronger than 1 to 150 is dangerous. James quotes from the records of 4 cases in which he administered the quinine by giving it subcutaneously—dissolving from 15 to 45 grains in 5 ounces of saline solution. He at times has injected as much as 10 ounces of the quinine solution into

the subcutaneous tissues. He states that a preliminary anæsthetizing of the site of the injection with cocaine enables us to give the hypodermoclysis without pain.—(E. R. S.)

BAGSHAW, ARTHUR G. Recent advances in our knowledge of sleeping sickness. Journal of Tropical Medicine and Hygiene, November 1, 1911.

As regards period of infectivity of *Glossina palpalis* it has been shown that while the parasites in the fly can produce an infection during the first two days after feeding on infective material, yet subsequently such infections can not be brought about until the lapse of a considerable number of days. In 28 experiments made from the third to the twenty-fourth day no infection could be brought about, but positive results were obtained on the twenty-fourth, twenty-eighth, thirtieth, thirty-sixth, and forty-sixth days, and this notwithstanding the fact that the gut of the tsetse fly swarmed with the parasites. The fact has been demonstrated that this late infectivity is coincident with the presence of trypanosomes of the "blood type" in the fly's salivary glands.

Laboratory experiments have shown that *G. morsitans* can transmit *T. gambiense*, Taute having fed 670 *morsitans* on an animal infected with the human trypanosome and then having them feed on 16 monkeys. Six of these monkeys became infected.

Hindle was able to infect female rats in every one of six experiments by dropping blood infected with *T. gambiense* into the vagina.

Three out of five rats were infected by spreading a drop of blood on the unshaven, uncut hair and coating the area with collodion. (Method of Manteufel.)

A very important point in the epidemiology of trypanosomiasis has been the work of Bruce, Hamerton, and Bateman in showing that *G. palpalis* injected with *T. gambiense* could transmit human trypanosomiasis to antelopes and that these antelopes did not show ill health. From these antelopes they were able to infect laboratory bred *G. palpalis* and subsequently to bring about infection of susceptible animals by allowing these same tsetse flies to feed on such animals.

As to diagnosis, Todd and Wolbach found that they were able to find trypanosomes in gland juice five times as often as with blood smears, even when thick smears were taken. Kinghorn, however, examined 119 men first by gland palpation and puncture, getting positive results in only two cases, whereas with blood examinations he found five additional cases.

The attachment method of Laveran and Mesnil may be of diagnostic value. This method, which was first introduced to determine

the specificity of a strain of trypanosomes, depends upon the attaching of the aflagellar end of the trypanosome to leucocytes when the inactivated serum of infected animals or man is added. The trypanosomes may be obtained from an infected rat, the leucocytes from a guinea pig.

Lange's agglutination test, made with an emulsion of trypanosomes obtained from the blood by centrifugalization and then adding serum from an infected animal, gives positive results some time before it is possible to find trypanosomes in the blood of the infected animal.

In connection with treatment, it was stated that the results with arsenophenylglycin varied greatly in different localities, being almost a specific in Togoland, of only moderate benefit in Uganda, and valueless in German East Africa.

The excellent results obtained with intravenous injections of tartar emetic where previous atoxyl treatment has been unavailing, was noted in the case of Kerandel. The statement was made that but little had been accomplished as to the value of Salvarsan, but, judging from animal experimentation, it was considered that it would be even less effective than arsenophenylglycin.

As regarded prophylaxis, it was stated that there was little that was new.

The bird-lime method of catching tsetse flies, however, had given very good results. The juice of a species of Euphorbia seemed to make the best bird lime, and when spread on cloth and applied in this way over the bellies of transport animals many flies were trapped.

Very interesting were the experiments when bred flies were fed on 35 native patients in various stages of the disease, and subsequently allowed to feed on monkeys. Except in the case of one patient, in whom clinical signs were marked, the results were negative.—
(E. R. S.)

COOPER, E. A., B. Sc., and FUNK, C., Ph. D. **Experiments on the causation of beriberi.** The Lancet, November 4, 1911.

A brief review of the rice theories as to causation of beriberi is given in the first paragraphs of the article. The authors summarize Schaumann's results as follows:

(1) Inorganic phosphates had no curative properties. (2) Phytin, which had been credited by Aron with some preventive properties, gave entirely negative results. (3) Complex mixtures, such as yeast, rice polishings, Katjang-idjoe beans, if administered to pigeons far advanced in the disease, produced a cure. (4) Although an impure commercial sample of yeast-nucleic acid cured the disease in 3 out of 14 cases (pigeons), it was not possible to obtain conclusive results with all kinds of simple phosphorus-containing substances, such as

lecithin, glycerophosphates, and phosphoproteins. For these reasons Schau-
mann suggested that phosphorus compounds can only exercise curative effects
when acting in conjunction with certain other substances.

The authors state that they have repeated the experiments of other
workers and that they have been able to produce polyneuritis with
polished rice and to prevent it with rice polishings. They have also
produced polyneuritis with exclusive carbohydrate diets, such as
starch, inulin, cane sugar, and dextrin. These results disprove any
intoxication hypothesis. Attempts to cure the polyneuritis with
phytin, edestin, casein, and egg yolk were unsuccessful. Dried yeast
in juice from compressed yeast was curative. After confirming the
work of Fraser and Stanton concerning the curative power of the
alcoholic extract after the phytin had been precipitated out they
found that phosphotungstic acid precipitated out from an aqueous
solution the entire curative substance. This precipitate when decom-
posed by baryta and therefore wholly devoid of phosphorus and also
free from carbohydrate or protein groups showed wonderful curative
power in pigeons affected with polyneuritis.

They state in conclusion that the curative principle is connected
with some substance devoid of phosphorus, not of a protein nature,
soluble in water and acidulated alcohol, dialyzable and precipitated
by phosphotungstic acid. They are now investigating the nature of
this precipitate.

[NOTE.—In connection with the above article the work of Chamberlain and
Vedder (Philippine Journal of Science, June, 1911) should be noted. They
found that the polyneuritis of fowls produced by highly milled rice was not
prevented by the ordinary potash salts, phytin, or phosphoric acid. There was,
however, in the rice polishings a substance which was soluble in cold water
and cold alcohol and possessed antidotal power.

They also brought forward evidence to show that of the phosphorus con-
tained in rice polishings only one-tenth of 1 per cent was concerned in pre-
venting polyneuritis gallinarum. Again they showed that this substance was
dialyzable, thus excluding colloids from consideration.]—(E. R. S.)

KOPANARIS, DR. PHOKION. Die Wirkung von Chinin, Salvarsan, und Atoxyl auf
die proteosoma (plasmodium præcox) infektion des Kanarienvogels. Archiv.
für Schiffs- und Tropen-Hygiene, Vol. XV, No. 18, 1911, p. 586.

The author was led to take up these investigations by reason of the
close relationship of bird malaria to human malaria.

In a series of tables it is shown in Table 1a that a mixture of 1 to
500, 1 to 1,000, and 1 to 1,200 quinine muriate with proteosoma and
allowed to remain in contact in vitro for 15 minutes failed to produce
infection. With quinine dilutions of 1 to 2,000 and 1 to 3,000 and
with a contact in vitro of 30 minutes the parasites were unaffected

and parasites were found in abundance in the blood of the birds from the fifth to the twelfth day.

In Tables 2a and 3a we have recorded the effects of intramuscular injections of quinine into canaries which had been infected six days previously with proteosoma. At this time each microscopic field showed several infected red cells. The following day it was not possible to find more than one infected red cell per field, and by the eleventh day the infection had disappeared. Control canaries showed at least 50 per cent of the red cells infected on the eighth day, or at a time when the quinine-treated birds were showing a marked diminution in the number of parasites.

Table 4a showed the effects of divided doses given on the sixth, seventh, and eighth days instead of a single larger dose, and the results, while comparable, are rather in favor of the single larger dose.

In Table 1b it is shown that birds which had been infected with proteosoma and seven days later treated with rather large doses of salvarsan showed far greater intensity and continuance of infection than did the control birds which did not receive salvarsan. Three of the salvarsan-treated birds died on the fifth, sixth, and seventh days, respectively, after receiving the dose of 0.0885 of salvarsan per kilogram.

Birds receiving a smaller dose of salvarsan (0.059 salvarsan per kilogram) showed practically the same results.

In Table 4b it is shown that birds which had been given an injection of salvarsan and after 24 hours had been inoculated with proteosoma showed lessened resistance to infection as compared with control birds which had not been given salvarsan.

In Table 1c is given the results of treatment with atoxyl. With this drug the results of infection varied but slightly in the drug-treated birds as compared with the control birds.

In summing up the results of his experiments he states that although the parasites disappeared from the circulation by the fourth day, yet there were present in the spleen gametes and young schizonts which reproduced the infection when such spleen substance was injected into other birds.

Again that the gametes, especially the macrogametes, showed a greater resistance to quinine than the schizonts.

In the fifth paragraph of the summary it is stated that quinine had no noticeable affect on the morphology of the parasites.

He notes that while salvarsan has been of therapeutic value in benign tertian infections of man, yet in proteosoma this has been the reverse—the infection being intensified. He also notes an increase after salvarsan of large mononuclears and eosinophiles and particu-

larly of azur granules. He states that the same phenomena occurred in man and guinea pig after injection of salvarsan.—(E. R. S.)

TAUTE, Dr. M., Stabsarzt i. d. Kaiserlichen Schutztruppe. **Experimentelle Studien über die Beziehungen der Glossina Morsitans zur Schlafkrankheit.** (Exp. studies on the relations between *Gl. Morsitans* and sleeping sickness.) Zeitschr. f. Hygiene u. Infektionskr. Bd. 69, Heft 3, 1911, p. 553.

Up to 1909 *Glossina morsitans* was thought to be incapable of transmitting the *Trypanosoma gambiense*. Wherever sleeping sickness occurred there also *Glossina palpalis* was found, and exceptional cases had always been satisfactorily explained. In 1909, however, several cases of sleeping sickness from northeast Rhodesia and Nyasaland had become known and in which *Glossina palpalis* could with certainty be excluded as an etiological factor.

In a very careful series of observations with a large number of glossinæ morsitantes, bred from the eggs and nursed with care on monkeys, Taute was able to show conclusively that the common tsetse-fly played the rôle of a real host and was not merely the mechanical transmitter of *Trypanosoma gambiense*, and that the development of the trypanosomes inside of the body of *Gl. morsitans* occupied the same time as in *Gl. palpalis*. Further observations showed that the flies became infective 21 days after their first feeding on monkeys suffering from sleeping sickness.

In 7.8 per cent of 282 glossinæ examined, trypanosomes in different stages of development were found; but only in one case, in which the infective group had been reduced to three flies, they were killed 69 to 71 days after their first feeding on infected monkeys, and after being kept alive by further feeding, each on a separate specimen of a sound monkey. Two of the flies were free from parasites, while the third showed appearances that were in every respect identical with those found in *Gl. palpalis*.—(MEDICAL DIRECTOR H. G. BEYER.)

PATHOLOGY AND BACTERIOLOGY.

By Passed Asst. Surg. M. E. HIGGINS, United States Navy.

EURICH, F. W. The detection of tubercle bacilli in sputum. Brit. Med. Jour., September 16, 1911.

The method described was published by Koslow in June, 1910, and is one of a number of procedures involving the use of "antiformin." The process is as follows:

A quantity of sputum is shaken up with antiformin in a glass-stoppered bottle or measure cylinder. If the sputum is thick and

viscid an equal quantity of antiformin is used; if thin and watery one-half as much antiformin as sputum is sufficient. After shaking for five minutes a volume of distilled water 10 times as great as the amount of antiformin used is added and the mixture again shaken for a few minutes. Finally there is added a mixture of ether and acetone, equal parts, in volume equal to the quantity of water used. The whole is then shaken for several minutes and allowed to stand. The contents of the bottle separate into three layers. The middle layer, appearing as a dense white ring, will contain nearly all the tubercle bacilli present. This layer is then removed with a pipette, and films made. The films are fixed by being passed through a flame and then immersed for a few seconds in a 5 per cent solution of sulphuric acid to remove any traces of alkali. The films are washed to remove the acid and stained in the customary manner.

Care should be observed that the distilled water used for diluting does not contain acid-fast bacilli.

"Antiformin" is prepared by adding a 15 per cent solution of sodium hydrate to an equal volume of liquor sodæ chlorinatæ.

The author states that 15 per cent of cases otherwise negative have proved positive by this method.—(M. E. H.)

STRONG, RICHARD P., and TEAGUE, OSCAR. **Method of infection in pneumonic plague.** Jour. Amer. Med. Assoc., October 1, 1911.

The object of the investigation in Manchuria was to show, first, whether in cases of pneumonic plague pest bacilli become disseminated into the air by the vapor arising from the breath, as in ordinary or in dyspneic respiration, and second, whether the organisms are disseminated by moderate attacks of coughing of pneumonic patients in whom the cough does not result in the expulsion of particles of sputum visible to the naked eye.

The experiments were performed by exposing sterile plates at varying distances before the mouths of patients in whom the bacilli had previously been demonstrated in the sputum.

They found that during normal and dyspneic respiration of primary pneumonic plague patients plague bacilli are not usually expelled by means of expired air. When such patients cough, however, even when sputum visible to the naked eye is not expelled, plague bacilli in large numbers become widely disseminated into the surrounding air. The distance from the patient that the air may be infected depends upon the strength of the cough, the amount of mucus present, and the air currents in the ward.

Doctors and nurses may be infected by means of sputum not visible to the naked eye, and the wearing of masks and the covering of

abraded surfaces are of great importance in personal prophylaxis of pneumonic plague. The eyes should be protected by proper glasses against conjunctival infection.

Articles of clothing worn in the wards should be immediately sterilized after removal, even though no visible particles of sputum may be present.—(M. E. H.)

GURD, F. B., and WADE, H. W., New Orleans. **Study of primary intimal arteritis of syphilitic origin.** *Jour. Med. Research*, Boston, September, 1911.

The writers studied the tissue from a case of syphilis in which the size of the vessels involved was sufficiently large to enable them to observe the changes in the three coats. Their sections showed that total occlusion of vessels having a complete anatomical structure does result from simple proliferation of the intima, and that syphilis must be recognized as one of the factors potent to produce this lesion.

In occlusion taking place in this manner endothelial proliferation is primary, this being followed by subendothelial fibrous tissue hyperplasia. The vascularization of this proliferated tissue takes place by growth inward from the adventitia. Necrosis in syphilis results both from formation of tubercle-like nodules by proliferation of cells with breaking down in center, and also from obliteration of vessels by intimal proliferation.—(M. E. H.)

KENDALL, A. I., and DAY, A. A. **The rapid isolation of typhoid, paratyphoid, and dysentery bacilli.** *Jour. Med. Research*, Vol. XXV, No. 1, September, 1911.

The importance of prompt bacteriological identification in patients, as well as in suspected bacillus carriers, led the authors to expedite existing methods of isolation.

The agar content of the Endo medium is reduced to 15 grams per liter, the reaction being just alkaline (instead of strongly alkaline) to litmus. A loopful of feces obtained from a small rectal tube is thoroughly emulsified in 10 cubic centimeters of sugar-free broth and incubated for one hour at 37° C.; the supernatant thin suspension of bacteria is inoculated (rubbed) on the surface of the agar plates with a sterile glass rod. Eighteen-hour colonies are found to be much larger and acidity much sooner apparent. Suspicious colonies, after 18 hours' incubation, are inoculated into small tubes containing 1 cubic centimeter of sterile sugar-free broth at 37° C. for two hours. The organisms are then tested with a known serum of high agglutinative power, dilutions of 1:200 and 1:500 being found reliable. At the end of two hours the results of agglutination test are reported. The time consumed from feces sample to report is thus 23 hours.

In practice this may be reduced to 20 hours, in case the agar has been incubated over night. Reference to the original article should be had for exact and more detailed technique and reasons for each modification of the usual procedure.

The reviewer has knowledge of the great satisfaction which this expeditious method is producing at the Harvard Medical School.—
(SURGEON C. N. FISKE.)

MCLAUGHLIN, A. J., passed assistant surgeon, Public Health and Marine Hospital Service. The bacteriological examination of stools as a measure of quarantine protection against cholera. The Boston Medical and Surgical Journal, October 12, 1911.

The writer states that individuals may carry cholera vibrios in the intestine, and yet exhibit no sign of the disease. He has known one case to harbor vibrios for 20 days, but most cases lose their vibrios in 10 days or less. Other writers have noted vibrios after 69 days, and if the gall bladder be involved, vibrios may be found, intermittently, after six months. Six and 7 per cent of normal individuals were carriers in an epidemic at Manila.

The danger of the carrier to others arises from improper methods of disposal of excreta and failure to wash the hands carefully.

Securing the specimen.—Magnesium sulphate given at 6 a. m., except when diarrhoea is present. Specimen may be had from the latter by large catheter or rectal tube with several eyes cut in the upper end. The use of swabs is not recommended.

Stool should be passed in paper cuspidor, which can be burned. Specimens planted on peptone, by small pieces of sterile wood, so that time is saved by not having to burn platinum needle. Each stick is discarded after use. Tubes are incubated at 35° to 37° C. for six hours, to enrich surface growth. Smears are made from surface (avoiding pellicle) and stained. If no curved organisms are found after 25 to 50 fields one who has had experience may decide it to be negative. It seems best for those having little experience to plate out each case from the peptone. Neutral nutrient agar, which has been dried by an hour in thermostat, is used. Suspected colonies may be fished out and tested with 1:200 specific cholera serum. The colony should be planted on an agar slant and incubated for 18 hours, and agglutination tested for in dilutions from 1:200 to 1:1,000.

Suspected persons should be isolated in groups, so that contacts are not made and quarantine can be shortened.—(ASST. SURG. G. F. CLARK.)

HEKTOEN, LUDVIG, M. D. On the local production of antibodies. The Journal of Infectious Diseases, September, 1911.

The writer states that it has not been determined definitely whether the power to produce antibodies is widely distributed among the cells of the body, or more or less limited to certain cells or tissues. Certain experiments have been made on the anterior chamber of the eye, pleura and peritoneum, and subcutaneous tissues. Ehrlich's lateral chain hypothesis assumed that any cell taking up or binding antigen was capable of producing antibody. That theory stimulated investigation. He quotes Römer's experiments on the immunization of rabbits with abrian, by way of the conjunctiva and thinks they may be explained by the general production of antitoxin and its deposit in the inflamed eye.

V. Dungren found that, if the iris be uninjured, no specific precipitation would appear in the aqueous humor in rabbits immunized with crab plasm by subcutaneous injection. Crab plasm was introduced into the anterior chamber, in one case, and antibody produced, but the writer doubts V. Dungren's conclusion that all cells produce antibody, as he has made some experiments on dogs by introducing rat or goat corpuscles in the anterior chamber of one eye and salt solution in the other. Sometimes he found a trace of opsonin for rat corpuscles. In no case did antibody appear until after it was found in the blood, and the amount in the injected eye was less than that of the blood stream. Sometimes the control eye showed antibody.

He quotes Wassermann and Citron's conclusions that the peritoneum and pleura developed lysin for typhoid bacilli, because, in some cases, the exudates caused lysis of *B. typhosis*, in higher dilution than that of the blood. He made experiments by introducing rat and goat corpuscles into the pleural cavities of dogs. He also injected some dogs intravenously. He found in most cases that intrapleural injection of antigen gave less concentration of antibody in the serum of the blood than intravenous injections and that in no case, after intrapleural injection of antigen, did the content of antibody in the serum of the pleural exudate exceed that in the serum of the blood, and was often a little less.

The writer quotes Wassermann and Citron's work on injection of typhoid bacilli into the ears of rabbits, and thinks that there were too few experiments for them to conclude that there was production of antibody in the subcutaneous tissues.

He quotes Wright as suggesting that massage, after vaccine injection, might increase antibodies in the blood, and so remove all doubt of local production. Rat and goat corpuscles were injected into the foreleg of a dog and skilled massage employed, but no increase

noted. He states that Russell explains the benefit of vaccine in typhoid fever by considering that the subcutaneous tissues are not ordinarily involved in typhoid fever, and that when vaccines are injected this unused center is thrown into action. If the tissues, at the site of the introduction of antigen, take effective part in production of antibodies, then there should be found a distinct difference in the amount of antibody in the blood of animals in which these tissues are removed in the early part of the course of antibody formation. Goat's blood was injected into the legs of five dogs and two days later the leg of each of two dogs was amputated; the opposite to the one injected was amputated in two others; the leg injected of the fifth was not amputated. The results did not indicate that the tissue at the site of injection of antigen took any measureable part in the production of antibody.

The results obtained from all the above experiments do not point to local production of antibodies in dogs injected with rat or goat corpuscles; at least, not so far as concerns the tissues of the anterior chamber of the eye, the pleura, and subcutaneous tissues.—(ASST. SURG. G. F. CLARK.)

MEDICAL ZOOLOGY.

Passed Asst. Surg. P. E. GARRISON, United States Navy.

BEALL, K. H., M. D., Fort Worth, Tex. **The Etiology of Pellagra.** J. Am. Med. Assn., Chicago, v. 57 (21), November 18, 1911, p 1683.

Several points are very strikingly brought out in Beall's brief study of the epidemiology of pellagra in Texas. Referring to Sambon's observations in Italy, confirmed by Roberts in Georgia, that pellagra occurs in the immediate vicinity of small, running streams, he states that in Texas "there are also regions where a running stream does not exist for miles and in these places pellagra is prevalent. In spite of a drought for the last three years, during which there were few running streams in Texas, except a few of the large rivers, pellagra has increased markedly." Speaking of individual cases he said that of 54 pilgrims but 4 lived less than one-fourth of a mile from a stream; 9 lived from one-fourth to one-half mile; 41 lived at least a mile; 2 lived 8 miles; 4, 10 miles; 1, 12 miles; 1, 50 miles; and 1, 60 miles from any over-ground collection of water.

The author then gives some striking age and sex statistics of pilgrims in Texas from an investigation of the pellagra situation made by the State board of health. Out of 189 deaths from pellagra reported to the State health officer, 153 were of females and only 36 were of males. This disparity between the sexes would indicate that

females are more exposed to the disease. Furthermore, of the 36 males, there were only 7 between the ages of 20 and 50 years. These two observations lead the author to two suggestions: First, that the etiological factor of pellagra is some thing or condition which exists in the home or "around the house;" second, that the agent may be active in the daytime only, for were it not so those who spend little of the day at home but most of the night would not show such immunity as seems to exist.

It is pointed out that in Italy, where the women work in the fields during the day, the incidence of the disease in females is only slightly greater than in males.—(P. E. G.)

CHEMISTRY AND PHARMACY.

Asst. Surg. E. W. BROWN and Pharmacist O. G. RUGE, United States Navy.

HEIDUSCHKA, A., and BIECHY, TH. Determination of arsenic in the urine after administering salvarsan. Apoth. Ztg., 1911, Bd. 26, S. 146.

The 24-hour specimen of the urine is treated with an excess of 12 per cent aluminium sulphate solution and then with dilute ammonia to the point of strongly alkaline reaction. The mixture is boiled for one-half hour and the precipitate allowed to settle. The clear supernatant fluid is decanted and the precipitate quantitatively collected by centrifuging. The combined decanted fluids are again precipitated with aluminium sulphate. The combined precipitates which contain the total arsenic of the urine, while still moist, are transferred to a 300 cubic centimeter flask, 5 grams of ferrous sulphate, and 50 cubic centimeters of 36 per cent HCl are added, three-fourths of the volume of the mixture is distilled off. The distillate contains all of the arsenic as AsCl_3 . This is transferred to a flask and 25 grams of KOH dissolved in 100 cubic centimeters of water added. The mixture is neutralized, 2 grams of pure NaHCO_3 are placed therein, 1 gram KI and 20 cubic centimeters of starch solution are added and the whole made up to about 150 cubic centimeters. An excess of $n/100$ iodine solution is added and titrated back with an $n/100$ solution of sodium thiosulphate. One cubic centimeter of $n/100$ iodine solution corresponds to 0.003748 grams As_2O_3 .—(E. W. B.)

ABELIN, J. A new method for the detection of salvarsan. Munch. Med. Wochschr, 1911, 19.

A very little of the substance to be tested for salvarsan is dissolved in 2 or 3 cubic centimeters of water, and the yellow solution is decolorized by addition of 3 to 4 drops of dilute HCl. After cooling the

solution 3 to 4 drops of 0.5 per cent solution of sodium nitrite are added. A diazo compound is formed, showing a vivid, yellowish-green fluorescence. The liquid is now added drop by drop to a 10 per cent solution of resorcinol, to which an excess of sodium carbonate has been added, and a beautiful red coloring matter is formed. Care must be taken that the liquid remains alkaline. When applying the process to urines, 7 to 8 cubic centimeters of the sample are acidified with 5 to 8 drops of dilute HCl. When cold, 3 to 4 drops of the above sodium nitrite solution are added. A few drops of the liquid are then added to 5 cubic centimeters of the alkaline resorcinol solution or the ring test may be applied successfully. Atoxyl treated as above yields a yellow coloring matter.—(E. W. B.)

VEXRUMBA, MARIE. A new method for the estimation of gastric acidity and its clinical advantages. (Med. Klin., Bern.) Intern. Belt. Path. Therap., 1911, 3, 53-85.

Principle.—If 10 cubic centimeters of gastric juice are treated with 1 cubic centimeter of potassium iodide and potassium iodate solution, the free acid present liberates iodine which yields an intense yellow to yellowish-brown color. On adding a few drops of starch solution, a deep blue color results. The free iodine is determined by titrating with a $n/10$ sodium thiosulphate solution until the blue color is completely discharged.

Technique.—The titration must be carried out cautiously, drop by drop. The decolorized fluid will again become blue if allowed to stand a few minutes, and must be titrated again until the decolorization is permanent. This new method yields essentially higher results for acidity than the congo-red titration. In pathological cases different amounts of acid are yielded in a comparison of the two methods. The iodiometric method is recommended as the more accurate, and, therefore, in the author's opinion, gives a more reliable index of the progress of severe cases of gastric ulcer and hyperacidity.—(E. W. B.)

LEHMANN, K. B., and HASEGAWA. The absorption of chloroform and other chlorinated hydrocarbons by men and animals from air. Arch. f. Hyg., 1911. Bd. 72, S. 327.

Air containing 20 to 35 milligrams of chloroform per liter was respired by the subjects. In men the absorption of chloroform was greatest, i. e., 74 to 80 per cent in the first few minutes of administration, then falling to an average of 60 per cent. The highest absorp-

tion figure in rabbits was 40 per cent; 42 to 90 per cent of the absorbed chloroform was again excreted. The absorption of tetrachloromethane and tetrachlorethane was also most marked at the beginning of the inhalations, soon falling to lower values.—(E. W. B.)

EYE, EAR, NOSE, AND THROAT.

Surg. E. M. SHIPP, United States Navy.

LOEB, H. W., M. D. **Acute nephritis following acute tonsillitis.** Jour. A. M. A., November, 1910.

The author reports four cases of acute nephritis, following acute tonsillitis. He draws the following conclusions regarding the relation between tonsillitis and nephritis:

1. Acute nephritis results from acute tonsillitis far more often than is generally supposed.

2. The symptoms ordinarily are not manifested until some time after the inception of the disease.

3. The nephritis is of the hemorrhagic type and differs from that of scarlet fever in that fever, edema, and oliguria are not marked symptoms of the disease. In addition, it follows the angina and is not concomitant as in scarlatina and diphtheria.

4. Judging from the course of the cases reported, there must be many in which a mild nephritis occurs incident to a tonsillitis, which goes on to resolution without patient or physician being conscious of its presence.

5. As each case of lacunar tonsillitis may be a potential source of acute nephritis, it is incumbent on practitioners to observe the urine, not only during the height of the disease, but for some time after as well.

6. Spontaneous or idiopathic nephritis is probably often due to a tonsillitis that has not been considered as an etiologic possibility.

The writer directs our attention to a very interesting subject. I have recently treated a case of peritonsillar abscess that was complicated by an acute nephritis, and have found large traces of albumin in the urine of a number of patients who were suffering from acute tonsillitis.—(E. M. S.)

CROCKETT, EUGENE A., M. D. **When shall we remove tonsils and what type of operation shall we do?** Boston Med. & Surg. Jour., March 23, 1911

The author states that the question of when to operate on tonsils, and what class of cases on whom to advise operation, is a very vital one in modern practice. He believes that, in many cases, the removal

of children's and adults' tonsils is advised for very insufficient reasons and without apparently regarding it as a critical operation. He further states that, as far as the occurrence of serious accidents and fatal results go in its performance in and around the city of Boston, it must be acknowledged that, in unskilled hands, it will show a higher mortality than an interval appendix operation in the hands of a good surgeon.

The occurrence of 12 deaths in Boston and its suburbs in the last year and a half following upon the removal of tonsils, as well as the occurrence of a large number of very serious hemorrhages is, in the opinion of the author, sufficient evidence to prove that it is not wise to advise such removal except on sufficient symptoms. The writer also states that a wide difference of opinion exists among physicians of this country, many of whom seem to regard the tonsil as the root of all medical evil. Take, for instance, in the question of rheumatism; while it is beyond question that a patient with large tonsils full of cheesy concretions and subject to repeated attacks of acute tonsillitis is liable to develop an acute nephritis and also acute articular rheumatism by reason of the existence of such throat condition, yet it does not follow that the tonsil is the whole cause of acute articular rheumatism.

Then, as to the question of glands in the neck (tubercular glands). We know from a large series of statistics that somewhere between 8 and 10 per cent of tonsils removed by operation show evidences of tubercular infection. Such tonsils do not differ microscopically from the usual hypertrophied tonsil. A much smaller proportion of cases are accompanied by glands in the neck. It is proven beyond a dispute that the group of glands just in front and just behind the sterno-cleido-mastoid muscle, when tubercular, are nearly always associated with disease of the tonsil, receiving their infection through it.

From the clinical standpoint, in the opinion of the author, there is ample warning of such condition occurring in the neck, and he believes that the removal of the infected tonsil within any reasonable length of time of beginning glandular infection of the throat will serve to remove the cause of the trouble before the throat becomes infected to an operative extent.

The writer further states that, to summarize and reduce to a definite statement the class of cases that one believes should be operated on, he is of the opinion that, in children, one should remove the tonsils in all cases where the child presents large nonadherent tonsils, largely filling the cavity of the pharynx, because of the obstruction in breathing that such cases present and of their possible influence upon nutrition and to secure the proper formation of the jaw at the period of second dentition.

Second. One should enucleate the tonsil in all cases where associated with enlarged glands in the neck, and in all cases of articular rheumatism when the tonsil is probably an etiological factor. These operations should be, as a rule, performed in a quiescent period, especially in the case of rheumatism. The existence of endocarditis in a more or less chronic state need not necessarily be regarded as a contraindication for operation.

Third. The tonsils should be thoroughly enucleated in all cases of repeated peritonsillar abscess.

Conversely, the tonsils should not be removed when they are of moderate size, i. e., projecting not over a quarter of an inch beyond the anterior and posterior pillars.

The author also believes that there is the possibility, in cases of persons with a well-developed musical voice, that the voice may be permanently injured, or they may have to change the whole musical method to obtain the same good results, so that even although some tonsils are distinctly pathological, he would advise against their removal.

With this exception, his position would be the same, as far as indications go, both for children and adults.

If we have decided to remove the tonsils, the author continues, what type of operation should we perform? If the case presents a clear history of infectious process, such as peritonsillar abscess, acute articular rheumatism, or tubercular infection of the neck, beyond question the whole tonsil should be enucleated and removed as completely as possible. This should be done by blunt dissection rather than sharp dissection. The method which the author follows is to incise the tissue between the tonsil and anterior pillar with a right-angle blunt-pointed Leland tonsil knife; a blunt dissector is then passed into this incision and swept up and down, thus separating the tonsil from the anterior pillar. The dissector is then passed over the top of the tonsil, at which point the operator should be careful to remember that the upper level of the tonsil is considerably above that of the velum palati. The dissector is then carried down between the tonsil and posterior pillar, but no traction is made upon the tonsil during the dissection. The Farlow tonsil snare is then threaded with a No. 5 steel wire and passed over the tonsil, the tonsil is seized with a lock vulsellum forceps and drawn well forward, free of the pillars, and the snare drawn home, either gradually or rapidly. The author considers this method of removal of tonsils safer in the hands of the average operator than dissection with the sharp scalpel or sharp scissors, and it removes the tonsil as thoroughly as any other method.

In an ordinary case of simple hypertrophy devoid of symptoms, the most common type in children, it is not necessary to remove the

base of the tonsil. Simply remove enough to bring it down to a normal size, so as not to project beyond the pillars. This may be done with a snare, or punch, or with the tonsillotome.

The writer further states that the particular accidents of which he has been personally aware have happened in the hands of men not used to general surgery, to say nothing of special surgery, but a few have happened in the hands of experienced operators. They are as follows:

1. Two cases of immediate fatal hemorrhage of the throat, with death in about two minutes, following sharp dissection of the tonsil with a knife.

2. One case of severe hemorrhage in the throat following sharp dissection with scissors relieved by ligation of the common carotid artery.

3. One case of death from strangulation from inhaled vomited material, the operating physician being unprepared for such an accident and, therefore, unable to do a tracheotomy.

4. One case of death apparently from anesthesia, possibly a case of enlarged thymus.

5. One case of slow hemorrhage from both tonsils following a sharp dissection partially checked by the use of the Mikulicz tonsil clamp, but followed two days later by hemorrhages in the skin and pneumonia, with death.

The author is of the opinion that any operation in the throat requiring the use of general anesthesia is too dangerous a procedure for anyone to perform who is not thoroughly competent to meet the surgical emergencies that may present themselves. These comprise the ability of the operator to ligate the common carotid, to ligate the tonsil pillars, to do an emergency tracheotomy, also to perform artificial respiration.

This subject is one that merits the careful consideration of every medical officer of the naval service.

A glance at the last annual report of the Surgeon General of the Navy shows that during the year 1909 there were 3,428 admissions to the sick list with tonsillitis. While this does not necessarily mean that all of these patients had hypertrophied or diseased tonsils, it is believed, however, that quite a large percentage of these cases developed in consequence of an abnormal condition of the nose and throat, which predisposed them to infection.

When we consider what 3,428 admissions to the sick list represents in the way of sick days and loss of time from duty, it is by no means a small matter. Ballenger, in his excellent work entitled "Diseases of Nose, Throat, and Ear," states that a prominent surgeon has said that the tonsil is of greater clinical importance than the appendix; that it causes more suffering and more deaths.

When we recall that the tonsil may be the seat of primary, secondary, or latent tuberculosis; that rheumatic fever, acute endocarditis, septic thrombophlebitis, pulmonary gangrene, acute suppurative osteomyelitis, infection of the glands of the neck, and acute nephritis may have their initial lesions in the tonsils, we are impressed with the clinical importance of these small organs and should consider them worthy of the most serious and painstaking study.—(E. M. S.)

BROWN, E. V. L., M. D. Recent contributions to our knowledge concerning sympathetic ophthalmia. The Jour. of Ophthalmology and Oto-Laryngology, February, 1911.

The author states that the true nature of sympathetic inflammation of the eye has always been and still remains a great unsolved mystery. He also states that it must be at once confessed that we do not know the organism causing the disease, whether it is a wound or some other peculiar insult which starts the trouble in the first eye, or exactly how it gets from one eye to the other; even when the disease is fully established in the second eye we can not make a differential diagnosis by the most careful examination unless we have the history of the trouble of the other eye, and then our "diagnosis is at best only a probable one."

It is, in the opinion of the writer, a matter of congratulation that definite progress is being made along certain lines.

First, it has been established that the disease produces certain well-characterized changes in the primary eye. We are indebted to Fuchs for this discovery. He finally established the anatomic basis of the disease and its constancy.

As now understood, the morbid process consists of a diffuse infiltration of the uveal tract, with round cells, accompanied by proliferation of epitheloid cells and giant cells. The iris, ciliary body, and choroidea are thickened either very uniformly throughout or by a very characteristic node formation, as in miliary tuberculosis. It is very significant that the uvea between the nodes may be entirely healthy and free from infiltration. This would lead one to believe that the disease does not progress from one part of the eye to another by direct continuity of tissue, but in some other way.

A third feature is the origin and full development of the process within the uvea, and not upon its surfaces. It comes to a full expression long before it breaks through the confines of the uvea. This finding is very important because it enables us in a given specimen to easily rule out ordinary inflammatory processes. These are largely fibrino-plastic and suppurative in character and come to most marked expression upon the surfaces of the uvea and not within its confines.

The sympathetic process is in reality a granulomatous infiltration inside the uvea. It is chronic in character, while these others are acute. The author states that in the course of 20 years Prof. Fuchs had removed nearly 200 eyes for sympathetic disease, and without knowledge of the clinical histories of the cases he found these changes in all except one of the cases, in which the record subsequently showed sympathetic inflammation to have been present. One can hardly demand more agreement than this between clinical and pathological findings.

It is further stated by the writer that the transfer of the disease from one eye to the other is now quite uniformly held to be by means of the general circulation. The theory of transmission along the optic-nerve sheaths to the other eye has been abandoned, and also the modified ciliary-nerve-irritation theory, which succeeded it, was quite conclusively disproved by Rosmer in 1903.

Within the past year an entirely new theory of sympathetic inflammation has been presented by Meller, of Vienna. It is based upon the above-mentioned works of Fuchs and Rosmer, and, in the opinion of the writer, better explains the ensemble of clinical and anatomical phenomena than does any other theory, despite its revolutionary character.

The prevailing theory has been that the infection entered the eye directly through a wound or other atrium from without.

For this Meller would substitute an endogenous theory of the course of events, as follows: First, there occurs some form of damage or insult to the uveal tract, such as a penetrating wound, a toxic iridocyclitis from a necrotic intraocular sarcoma, etc., which lowers the resistance of the part; second, some other part of the body than the eye is the portal of entry for the specific organism. This organism has an elective affinity for uveal tissue, and attacks that of the diseased eye because of its lowered resistance. Here it finds a favorable medium for development, and at length attains sufficient virility to attack the healthy uvea of the other eye. This endogenous theory better explains the cases in which no wound or opening of any kind can be found to have occurred.

Again, the long period between the outbreak of disease in the first and in the second eye is easily explained; here the general infection does not occur for years after the eye is injured. On the other hand, the exogenous theory must suppose a period of latency of an organism in the eye for the length of which we have no parallel, or else hold that inflammation of a low grade exists throughout the period. Against this latter supposition is the fact that of all the wounded eyes without history of sympathetic inflammation that have been studied only one has been found to have any areas of "sympathetic infiltration."

The author states that difficulties in diagnoses are great.

Active inflammation is always present in the exciting eye when the second eye becomes inflamed, but it may be confined to the back part of the uvea and entirely hidden by an opaque cornea or lens. The period of greatest danger is between the fifth and twelfth weeks, yet cases occur as early as 10 days and as late as 30 years after injury. The trouble, too, may break out after the primary eye has been enucleated, though it is said not after a period of five weeks has elapsed.

As stated above, there is nothing in the appearance of the second eye in sympathetic inflammation absolutely diagnostic of the condition, but certain findings occur with great frequency. Among these are fine clumps of cells and pigments which form precipitates on the posterior surface of the cornea. These come from the uvea, especially its anterior segment. The changes in the iris are often very characteristic. The tunic thickens, deep posterior synechia binds the entire expanse of the iris to the lens, and an ominous retraction of the root of the iris follows. Deep grooves in the tumefied tissue radiate out from the pupil and new blood vessels form on the surface.

Lastly, much attention is now being given to a peculiar fleck-form disease of the anterior and middle portions of the fundus. These flecks or nodes are quite numerous and probably lie entirely within the choroidea.

The disc and macular region are free and vision is little affected if clouding of the vitreous does not develop.

According to the author, the prognosis is not invariably bad, despite a widespread opinion to this effect. Useful vision is retained very frequently, especially after sympathetic choroiditis. Children and young adults seem especially prone to this form of the disease. Anything better than one-tenth is medicolegally considered useful vision.

The writer states that Schermir found useful vision in 14 per cent of 35 cases after a lapse of five years, and Hermann records a favorable outcome in 63 per cent of 30 cases one year after the disease.

No marked advance in the treatment of sympathetic ophthalmia has been made in recent years, except in the use of huge doses of sodium salicylate. One grain per pound of body weight is the dosage. Atropine should be used as long as it keeps the pupil open and will be tolerated.

Mercury by inunction is another form of treatment recommended by some authorities.

The author believes that early enucleation should theoretically have good effect upon the further development of even outspoken sympathetic inflammation, because it removes a depot from which further infection and reinfection may occur.—(E. M. S.)

THEOBALD, SAMUEL, M. D. A protest against the indiscriminate use of the organic compounds of silver in ophthalmic practice. Johns Hopkins Hospital Bulletin, November, 1911.

The author states that, whatever be the explanation, whether due to their chemical composition, the greater freedom with which they are used, or to their supposedly greater penetrating power, there can be no doubt that the organic compounds of silver, particularly protargol and argyrol, are responsible for many more cases of conjunctival argyria than ever was or is silver nitrate.

Before these compounds came into use argyria of the conjunctiva was a rare condition, practically never seen except in old cases of trachoma. Now it is relatively common, and is met with not only in chronic conditions, such as trachoma, but in acute affections as well, in which the silver treatment has been of comparatively brief duration.

In several cases of gonorrheal conjunctivitis in the adult, in which the author used protargol, a decided staining of the bulbar conjunctiva resulted, and the same thing happened in a case of acute trachoma after only a few weeks treatment.

The writer further states that he has no unreasoning prejudice against the use of these newer silver preparations, and that it is, therefore, not against the use, but against the indiscriminate use, of the organic silver compounds that he would protest.

There is, in the opinion of the author, an almost universal habit, particularly among the younger generation of ophthalmologists and general practitioners as well, of employing argyrol or protargol in the treatment of acute and chronic catarrhal conjunctivitis. This practice, in his judgment, is wholly indefensible, since we have a remedy in a collyrium containing half a grain of zinc sulphate and 10 grains of boric acid to the ounce that is cleanly, and that is not simply as efficacious but is more surely and more promptly efficacious in these conditions than either of the silver compounds mentioned.—
(E. M. S.)

NANCE, WILLIS O., M. D. Two additional cases of iritis treated with salvarsan. Ophthalmic Record, September, 1911.

At the meeting of the Chicago Ophthalmological Society, May 15, 1911, Nance reported two additional cases of acute iritis which had been treated with "606." The results following the use of the Ehrlich preparation were prompt and positive. In one instance the deep and intense ciliary injection had entirely cleared 48 hours following the injection. In the other, an unusually virulent type with iritic gumma, the patient was practically well, so far as appearance indicated, three days after injection.

One case was doubly interesting, in that the eye that was treated according to the classical mercury and iodide method last fall required four weeks to clear up, and at the present time there are positive and pronounced evidences of permanent posterior synechiae, in contrast to the rapidity with which the symptoms disappeared in the salvarsan-treated eye and the entire absence of any sequelæ.

If further and elaborate clinical experience demonstrates that "606" can be depended upon to produce results in from two to four days, as it has in the present cases, or even in two or three times this length of time, it appeared to Nance that its use would be a marked advance in ocular therapeutics, in not only saving the patient days or weeks of suffering and inconvenience, but in preventing the occurrence of permanent, and at times serious, sequelæ, as posterior synechiae and choroidal involvement.—(E. M. S.)

ROBINSON, WM., M. S., F. R. C. S., England. **Removal of the eyeball: A quick and easy method.** *The British Medical Journal*, November 11, 1911.

The following is a brief description of the author's method of removing the eyeball:

The only instruments required are: An eye speculum, a pair of toothed fixation forceps, a small pair of blunt-pointed scissors (straight or curved on the flat), and a curved needle threaded with fine iodized catgut.

The patient is anaesthetized. Unless the surgeon be ambidextrous, to remove the right eyeball he stands at the head of the table, and to remove the left at the patient's left side. The speculum is inserted; the eyeball is grasped from above downward, with the fixation forceps rather more than one-third of an inch behind the outer margin of the cornea, a firm hold being taken of all the structures down to the sclerotic and including the tendon of insertion of the external rectus. This tendon is inserted into the globe one-fourth inch from the cornea. The hold with the forceps is to be retained until the eyeball is removed. A firm snip with the scissors, pressing their nose well against the globe, divides the conjunctiva, Tenon's capsule, and generally most of the tendinous fibers of the muscle. With additional snips the tendon is completely divided. One blade of the scissors is now pushed well home under the conjunctiva—first above and then below the cornea—and that membrane is divided around and as close up to the cornea as possible. No more conjunctiva than is necessary should be removed, in order that a plentiful lining may be left to the socket. By rotating the eyeball as far inward as possible the optic nerve is brought close up to the outer canthus and is easily divided either near to or far back from the eyeball, as circumstances

may require. The eyeball can now be lifted well out between the lids, held apart by the speculum with the forceps, which are still retaining their original hold, and the various muscles easily divided by the aid of sight at their insertions into the globe. The whole of this procedure frequently does not require more than one minute. The bleeding is stanchd. The cut edges of the conjunctiva and subjacent structures are now sutured, beginning at the inner side. After pulling the cut edges well out between the lids with the forceps, the first stitch is inserted and tied. By keeping the thread sufficiently taut with the left hand the cut edges of the conjunctiva are kept outside the lids and the subsequent passages of the needle are greatly facilitated. By passing the needle twice through the last loop before pulling it tight the end of the suture is secured. The speculum is now removed.

Careful suturing prevents the formation of the troublesome button of granulation tissue which otherwise forms.

The order of procedure may be reversed by dividing the internal rectus tendon first.

If it is desired to sew the cut tendons of the lateral straight muscles together and those of the superior and inferior straight muscles, to facilitate the process each of the tendons should be caught by a pair of fine catch forceps before being divided.—(E. M. S.)

REPORTS AND LETTERS.

SANITARY REPORT ON HAMPTON ROADS, NORFOLK, AND VICINITY.

By Surg. G. A. LUNG, United States Navy, Fleet Surgeon, United States Atlantic Fleet.

Typhoid fever prevails in Norfolk throughout the year, more cases occurring in June, July, August, and September than the other months. The number of cases in proportion to the population is not very large. The report of the commissioner of health for the State of Virginia for 1910 gives the estimated number of typhoid cases for that year in Norfolk County as 157. The city of Norfolk includes nearly all of the county of that name, and has, according to the last census, a population of 81,524. Negroes comprise one-third of this number.

No definite data regarding venereal diseases was obtained. The only houses of prostitution are located in Newport News and Norfolk. At the latter place the board of health has instituted a system of surveillance. All the inmates are duly registered and periodically inspected. When an infected woman is discovered she is removed to Craney Island, where she is treated and cared for until well and otherwise disposed of.

The water supply of Norfolk is not wholly above suspicion. It comes from a small lake, some 4 or 5 miles east of the city. Before being pumped into the mains it is treated by filtration and the use of chlorid of lime. The shores of the lake are carefully policed. Under certain restrictions persons are allowed to go boating on it and to fish in its waters. The supply is inadequate for the growth of the city, and negotiations are now being entered into for a larger and better supply.

Fortress Monroe, Phoebus, Hampton, and Newport News receive their supply of water from one source, a lake along the line of the Chesapeake & Ohio Railroad, about 30 miles from Fortress Monroe. The natural conditions and the method of treating the water are about the same as for the Norfolk supply. Maj. Reynolds, the senior medical officer at Fortress Monroe, pronounced it the best to be had in this locality.

Until a year or two ago the town of Phoebus got its water from driven wells. Most of these were in the yards of individual owners

and were made by driving an iron pipe of ordinary size into the sandy soil to a depth of 12 or 15 feet. It was noticed that following a heavy rain, which had been preceded by a dry spell, typhoid fever became more prevalent. These wells are now nearly all abandoned.

The cities of Norfolk, Portsmouth, Phoebus, Hampton, and Newport News are provided with a system of sewers for the disposal of fecal matter. But few privies or cesspools remain, and they are rapidly being abandoned as connections are made with sewers. These sewers discharge their contents into nearby waters and are suspected of polluting the numerous oyster beds. Night soil is not used by farmers or truck gardeners.

The milk supply of Norfolk comes from 29 dairies. These are carefully inspected by employees of the board of health. The cattle are periodically examined for tuberculosis. Daily bacteriological tests are made of the milk as it is brought to the city. The inspection of the dairies is based on "health and general condition of cows," for which the maximum mark of 22 is given; on "cleanliness and location of stable and cows," with a maximum mark of 30; "cleanliness of utensils and in milking," maximum mark 25; "cleanliness, construction, and location of milk rooms and cleanliness in handling milk," maximum mark 23. The total maximum is therefore 100. For the month of August, 1911, but 2 dairies were marked by the inspections as above 90 in excellence; only 5 were marked between 80 and 90; 12 between 70 and 80; 12 between 60 and 70; and 3 received markings of 57.4, 55.1, and 53.2, respectively. The records shown me disclosed the fact that at times the bacteriological test revealed a larger bacterial content than could be regarded as safe. An excellent supply of milk is furnished by the dairy of the model farm belonging to Hampton Institute. This is not available except by definite prearrangement and for a sufficiently long period to make the transaction profitable to the institute.

In February, 1909, the health department of Virginia investigated the sanitary aspects of the oyster industry of Virginia. The result of these investigations is embodied in an official report. From this report I learn that oysters from 96 different localities were examined. These localities were in the waters near Norfolk, Newport News, Hampton, Phoebus, and at other places in Chesapeake Bay. The quality of the oysters in these investigations were determined by the presence or absence of the colon bacillus. Of the 96, 10 were pronounced "bad," and 24 were pronounced "suspicious." Those pronounced bad were specimens obtained from the waters near Norfolk, Newport News, Hampton, and Phoebus. The best oysters were obtained from points more remote from these places.

Malaria does not appear to be common in the places visited. In Norfolk a rigorous campaign for the extermination of the mosquito

has been carried on. This work has been very materially helped by Surg. Wertenbaker of the Public Health and Marine-Hospital Service. The northern limit of the habitat of the *stegomyia fasciata* is the latitude of Hampton Roads, and a good many years ago an epidemic of yellow fever occurred at Norfolk.

From the annual report of the commissioner of health of Virginia for 1910 I quote regarding hookworm disease:

It was found that in practically every county of the State scattered cases and isolated foci of the disease could be found, and that in a very large portion of the State the evidence pointed strongly to heavy infection. As a result of this detail work, it has been established that practically the whole of the tidewater section of Virginia is heavily infected, and that the entire southern border of the State from the Atlantic to the Blue Ridge Mountains is in a similar deplorable condition.

Since July, 1908, the Virginia State Board of Health has been reorganized and a generous annual appropriation made for its maintenance and the carrying out of its labors. Experts are available, popular public instruction in the prevention of disease and general sanitary knowledge has been disseminated. It has led to the organization of local boards of health where none existed and inspired to renewed effort those already organized. In Norfolk a newly organized board of health is in operation. It is fashioned after that of the city of Boston, Mass. The present head of the board, to better fit himself for the performance of his duties, has taken a special course in sanitary science at Harvard University. The board is at present actively engaged in improving the general sanitary condition of the city in a rigorous campaign of mosquito and fly extermination, in food and milk inspections, and a thorough supervision of the venereal problem. It has a well-equipped bacteriological department and at the head of it a skilled bacteriologist. A number of the physicians of the city are employed by the board, who assist in its work.

A little over a year ago the physicians of the towns bordering on Hampton Roads and neighboring waters effected an organization the purpose of which was to inquire into and promote better sanitary conditions. It has been productive of much good. From the above it will be seen that there exists at the places visited a vigorous and intelligent effort to promote better sanitary conditions. I am of the opinion that some evils heretofore existing have been lessened or entirely removed and that present conditions will be improved as time offers.

While ships of the Navy are at Hampton Roads considerable quantities of food are purchased there for the enlisted force. These consist of potatoes and onions, sometimes corn, watermelons, and other fruits and vegetables. They are obtained from contractors in Fortress Monroe or Norfolk, and such supplies are usually the product of

the surrounding country. Officers' messes are dependent almost entirely on the local markets for their food supplies, especially certain meats, milk, fresh fruits, and vegetables. Phoebus and Hampton offer no good markets; Newport News is too remote. Most that is purchased is obtained in Fortress Monroe and Norfolk, and this likewise is the product of the surrounding near-by country.

When general liberty is granted almost none of the men go to Phoebus and Hampton. A few go to Newport News; the majority spend their time and money in Norfolk.

Having made these investigations, I am led to believe that it will be safe to grant general liberty to ships at or near by Hampton Roads, except during the months of June, July, August, and September. Before going ashore, officers and men should be warned of the danger of drinking water and milk of unknown source, and of the peril of consuming ice cream and soft drinks made in the vicinity. The danger of eating uncooked vegetables should be emphasized. Lettuce, celery, radishes, strawberries, or any kind of fruit or vegetables that has been in contact with the earth or soiled with handling and exposure should not be used before being cooked. Oysters should be regarded with suspicion, and only used after being cooked. No food of any kind should be eaten that has been exposed for a time to the possible contamination by flies.

THE RECENT PELLAGRA CLINIC AT COLUMBIA, S. C.

By Passed Asst. Surg. P. E. GARRISON, United States Navy.

At the call of the South Carolina State Board of Health the physicians of the State, State medical officials, representatives from other States and from the medical services of the Federal Government met at Columbia, S. C., on November 2, 1911, to consider the subject of pellagra. There were two facts most strikingly in evidence at this meeting: First, the urgent gravity of the situation presented by pellagra in certain parts of the United States; second, the earnestness and thoroughness with which the problems of pellagra are being attacked. It will be possible to review only the more important points brought out at the meeting in the papers read and the clinical cases presented, especially the points of difference between pellagra as it has been known in the Old World and as it is manifesting itself in this country.

Data of the actual prevalence of pellagra are still far from complete, either as regards the general geographic distribution of the disease in this country or its frequency in recognized endemic localities. It has been found from the Atlantic to the Pacific and from

the Gulf of Mexico to the Great Lakes. Its areas of greatest prevalence are, so far as known, the South Atlantic and Gulf States, Illinois, Kentucky, and Tennessee.

Several interesting points are being brought out regarding its local distribution within endemic areas. In South Carolina the great majority of cases appear to come from the relatively high table-land forming the northwestern half of the State, the low-lying coastal plain to the southeast being relatively free. Still more locally, the disease appears to occur in small towns—the “mill villages”—quite as frequently as on the open farms, if not more so, differing in this respect from its occurrence in Europe, where it is described as distinctly rural in its distribution. Furthermore, there is some indication that in this country a certain house or group of houses serves as a focus of the disease, though evidence on this point is not yet conclusive.

As to the social distribution of the disease in the United States, while it is certainly more prevalent among the poorer classes, cases are being reported with sufficient frequency among well-to-do families to break down in a measure the axiom so universally recognized in the pellagrous countries around the Mediterranean that pellagra is essentially a disease of poverty.

The sexual incidence of the disease in this country appears to differ from that in Italy in that woman pellagrins have been reported with considerably greater frequency than have men, among both whites and negroes. No greater race susceptibility has been demonstrated in either whites or blacks.

The possible percentage frequency of pellagra in the population at large of the infected areas is still largely a matter of speculation. There would seem to be little question that the number of cases is much greater than the number of diagnoses indicates. Of 587 cases admitted to the South Carolina State Hospital for the Insane since January 1, 1911, 162, or 27.5 per cent, were pellagrins, and of the women admitted, one-half had pellagra on admission. As is natural in a disease hitherto unrecognized, general practitioners are slow to make diagnoses without consultation with specialists. Cases are now numbered in thousands and are being reported with constantly increasing frequency, and there is probably little question that pellagra has become one of the greatest menaces to the public health in this country, although five years ago it was scarcely recognized.

While it would seem probable that the manifestations of pellagra in this country are of a severer type than those of the Old World, it is being recognized that the prognosis is not so hopeless as was at first supposed. In advanced cases, and these are the cases (asylum cases) from which most of our early information on the subject has come, the outlook for recovery is extremely bad. As early cases are

being recognized in the population at large, reports of apparent recoveries are becoming more and more frequent.

It is the general opinion that pellagra has not previously existed in the United States to the same extent it is now being found, but evidence is accumulating that it has been present a great many years in at least sporadic cases. In this connection Dr. Babcock gave the history of a case at the South Carolina hospital in 1834 which bore the diagnosis "scorbutic habit," but which gave clinical symptoms seemingly typical of pellagra. How long the disease has been present in this country unrecognized is of important interest in connection with its etiology.

With regard to the cause of pellagra, the greater number of those prominent at the meeting were unwilling to subscribe to either of the two most generally recognized hypotheses of the etiology of the disease. A few were strongly of the opinion that spoiled maize was in some way the causative agent, while a few others inclined to the protozoan theory of Sambon, with *Simulium* flies as the agent of transmission. Several of the papers read indicate by their themes this prevailing attitude of suspended judgment regarding the cause of pellagra and at the same time the determination to attack the disease along all possible lines until a satisfactory demonstration of its causation makes plain the true prophylaxis. Mr. E. J. Watson, State commissioner of agriculture, told of the campaign being waged in South Carolina to exclude spoiled corn from the State on the ground that, whether the cause of pellagra or not, it was a highly undesirable food. Mr. W. V. King, of the United States Bureau of Entomology, spoke of the systematic effort being made under the State bureau of health to determine the biting insects prevalent in South Carolina which might serve as disease transmitters. Dr. Ernest Cooper presented a statistical study of the intestinal parasites of pellagrins at the State hospital. Passed Asst. Surg. C. H. Lavinder and Asst. Surg. R. M. Grimm, of the United States Public Health and Marine-Hospital Service, each presented papers on the epidemiology of pellagra, Dr. Grimm's paper being a report of studies made of an outbreak of pellagra in eastern Tennessee. Dr. Lavinder emphasized the extreme care necessary in collecting and, more particularly, in interpreting epidemiological data.

While pellagra as seen in this country appears to be of a severer type than that of Italy and other Old World endemic areas, there is no question of the identity of the disease. The same seasonal periodicity and the same triad of alimentary, cutaneous, and cerebrospinal symptoms marks its course, while it appears likewise to be subject to the same frequent and extreme variation from its typical manifestations.

The spring onset is, on the average, probably somewhat later here than in Italy, many cases occurring in May and June rather than in

April and May, while a considerable number of cases show the first symptoms as late as August and September.

After more or less marked premonitory signs, such as lassitude, insomnia, loss of appetite, indigestion, headache, backache, or disturbance of vision, the attack is apt to first manifest itself by intestinal disturbances, usually diarrhea, which may be more or less severe and may be accompanied by sore mouth and more or less gastric derangement. With these symptoms, or shortly subsequent to them, may appear the skin eruption, which is first a simple erythema resembling sunburn, and is typically distributed symmetrically on the backs of the hands, on the neck, and on the dorsum of the feet, especially if the patient has gone barefooted. The skin eruption, while appearing first and most commonly on sun-exposed parts, may be found on other locations, notably on the tips of the elbows, extending down the ulnar border, and over the patellar tendon, extending down the tibial border.

Many of the cases demonstrated showed this distribution, as well as the striking bilateral symmetry and the sharp line of demarcation characteristic of the typical pellagra eruption. Some cases gave the simple early erythematous rash and others the swollen, edematous, sometimes vesicular, dermatitis characteristic of a later stage of the disease. Due to the lateness of the season, however, most of the skin lesions had passed into the atrophic, desquamating stage. In some of the advanced cases this was very marked. A few showed involvement of the palms and soles, which are usually exempt.

In many cases the condition of the mouth and tongue was particularly interesting. In addition to the intensely red mucosa, extreme salivation, and markedly swollen, moist, beefy appearance of the tongue, attention was called to a brilliant red injection of lingual papillæ, particularly near the tip of the tongue. The appearance of these papillæ seemed to be constant in early cases and may prove of aid in diagnosis.

As most of the cases seen were "asylum cases," marked mental derangement was already present. In a number of private patients, whom we had the privilege of observing through the kindness of Dr. Babcock and of Dr. Watson, the cerebral symptoms were slight or absent. This was particularly marked in a few patients who had come in from the surrounding country for diagnosis, in some of whom barely sufficient involvement of the cerebro-spinal system could be elicited to complete the symptomatic triad and make the diagnosis practically sure.

The psychoses present in the advanced cases were of extremely varying types, ranging from mild "confusional insanity" to advanced dementia. Most patients presented a depressed or melancholic type of psychosis, though in some this element certainly

was not striking. In a few there seemed to be more or less exaltation. While, as a rule, the cases with advanced mental derangement were those of several years' duration, many had rapidly passed to profound dementia apparently within a few months or even a few weeks after the first onset of the disease. The varying forms and degrees in which the cerebro-spinal, alimentary, and cutaneous symptoms were manifest presented a great variety of clinical pictures, which it is not practical to describe in a small space.

As intimated above, the treatment of pellagra does not appear to be so fruitless a task as it was considered a few years ago. This applies particularly to cases recognized early—and much stress is laid upon early diagnosis. In the absence of specific drug treatment, undoubtedly the two most important measures are rest and a full nutritious diet. The diarrhea must be checked, and this is frequently a matter of extreme difficulty. Insomnia is usually troublesome and should be combated with drugs if necessary. The consensus of opinion at the meeting appeared to be that arsenic was distinctly valuable; the most favored method of administration being intramuscular injection of atoxyl. On the other hand, Dr. Watson, after wide experience with the disease, is emphatic in his opinion that arsenic not only is not indicated, but is frequently harmful, and he has discontinued its use entirely. Arsenic and quinine, together with a full nutritious diet, rest, and such symptomatic treatment as may be indicated, are the measures usually employed. In a limited number of cases salvarsan has appeared to be strikingly effective, but on the whole reports of the use of this drug are contradictory.

The uncertain and unsatisfactory status of all therapeutic measures tried in the treatment of pellagra only emphasizes the urgent need of discovering the true etiology of the disease in the hope that it may be attacked effectively by a rational prophylaxis.

The full program of the meeting follows:

NOVEMBER 2, 1911, 2 P. M.

PRESENTATION OF CLINICAL CASES.

How long has pellagra existed in South Carolina? A study of local medical history. By J. W. Babcock, M. D., superintendent, State Hospital, Columbia, S. C.

Remarks on epidemiologic studies as related to pellagra. By Passed Asst. Surg. C. H. Lavinder, United States Public Health and Marine-Hospital Service, Washington, D. C.

A demonstration of the simuliidæ flies. By P. E. Garrison, M. D., passed assistant surgeon, United States Navy, Washington, D. C.

Preliminary observations in pellagra locations in South Carolina from an entomological standpoint. By Mr. W. V. King, entomological assistant, United States Bureau of Entomology, Department of Agriculture, Washington, D. C.

Pellagra: A study in its epidemiology. By R. M. Grimm, M. D., assistant surgeon, United States Public Health and Marine-Hospital Service, Washington, D. C.

Handling the spoiled-corn problem: Conditions encountered in the South and the determination of deterioration. By E. J. Watson, commissioner of agriculture, Columbia.

Samson's theory of pellagra. By J. H. Taylor, M. D., Columbia.

NOVEMBER 2, 1911, 8 P. M.

Report of pellagra in Iowa and other western States. By E. E. Richardson, M. D., member of the State board of health, Des Moines, Iowa.

Report of pellagra in Virginia. By B. R. Becker, M. D., Richmond, Va.

Report of pellagra in Tennessee. By a commissioner of the Tennessee State Board of Health.

Exhibition of lantern slides, demonstrating various types of pellagra.

The gynecological, obstetrical, and surgical aspects of pellagra (a second report). By E. B. Saunders, M. D., assistant physician, State Hospital for the Insane, Columbia.

Intestinal parasites of pellagrins and nonpellagrins: A comparative study. By Earnest Cooper, M. D., pathologist, State Hospital for the Insane, Columbia.

The diagnosis and treatment of pellagra. By J. J. Watson, M. D., Columbia, S. C.

The eye symptoms of pellagra. By E. M. Whitney, M. D., Columbia, S. C.

A VISIT TO THE FINSEN INSTITUTE.

By Surg. R. B. WILLIAMS, United States Navy.

The Finsen Institute, at Copenhagen, founded by the celebrated Niels R. Finsen, has now become a state institution. Here a thousand and more cases of lupus vulgaris, a disease considered practicably incurable by the older methods, have been treated and cured. It is to the genius of Finsen alone that the world is indebted for a means of relief and cure for this disfiguring and loathsome disease.

Finsen was born in the Faroe Islands December 15, 1860, and died at Copenhagen September 24, 1904, having received the Nobel prize as a reward for his labors and discoveries. The greater part of the value of this prize he donated to the institution which bears his name.

To make plain the principles underlying the treatment of disease by light, a few preliminary remarks are necessary: As is well known, the prism separates a beam of white light into the following colors—red, orange, yellow, green, blue, indigo, and violet. The spectrum may be further divided into heat and chemical rays. Red, orange, and yellow are the visible heat rays; blue and violet, the visible chemical rays. Besides these there are the ultra-red, or invisible heat rays, and the ultra-violet, or invisible chemical or actinic rays. Numerous

experiments by Finsen and others have proved that to the effects of these chemical rays are due such phenomena as sunburn, the stimulating effect of light upon the lower orders of animal life, and the bactericidal effect of light. Upon the skin, for example, the heat rays produce an immediate effect, whereas the effects of the chemical rays are only manifested after some hours.

The demonstration of the fact that the skin lesions resulting from exposure to bright light are due to the chemical rays of such light led Finsen to propose that in the treatment of certain exanthemata, notably smallpox, the chemical rays be excluded. This is accomplished by screening the patients from sunlight by means of a red glass, red paper, or red hangings. This is the well-known red-light treatment of smallpox. Numerous statistics have proved its great value. By it pustulation and scarring are almost entirely prevented. This treatment must be applied early in the disease, and the chemical rays must be rigidly excluded.

Exclusion of the chemical rays of light may be said to be the negative method of treatment. Far more important is the method by which these rays are intensified and concentrated upon the part, thus employing their bactericidal and stimulating properties.'

In Finsen's earlier work in the treatment of lupus the sun was used as the source of light. The sun's rays were concentrated by a hollow plano-convex lens filled with a copper-sulphate solution to prevent the passage of heat rays. It was found that glass prevented the passage of many of the chemical rays, so that now lenses of rock crystal are used exclusively. It was later discovered that with lenses of rock crystal the copper-sulphate solution was not only unnecessary, but even harmful in that it prevented the passage of a certain proportion of the chemical rays.

As the sun is a very uncertain source of light, especially in the latitude of Copenhagen, the voltaic arc light has been substituted. The arc light is moreover richer in ultra-violet rays. The apparatus as now used may be briefly described as follows:

An arc lamp of 70 amperes, equal to about 30,000 candlepower, is suspended from the ceiling and is surrounded by four concentrators, which slope downward. Each concentrator is in the form of a telescope, consisting of two cylinders, each fitted with two plano-convex lenses of rock crystal. Between two of these lenses, in the lower piece of the telescope, there is a layer of distilled water, and around this cylinder there is another, and between the two cold water is circulated. There is also a cooling device at the upper (large) end of the telescope.

Even when robbed of a part of its heat by passing through a layer of cooled water, the concentrated light rays are too hot to be applied directly to the skin, so that further cooling is necessary. This is

accomplished by use of a pressure glass. This pressure glass is made of two plates of rock crystal fitted into a metal ring and provided with two openings for tubes. In the space between the plates cold water circulates while the apparatus is in use. This device not only serves the purpose of keeping the part under treatment cool, but, as it must be pressed firmly against the surface to be treated, it renders this area comparatively bloodless. This bloodless condition is an essential factor in successful treatment. As Finsen demonstrated by his experiments upon the ear, blood makes an effectual barrier to the passage of the chemical rays. The pressure glasses are made in several shapes and sizes, so that various angles and corners can be reached and pressure made thereon.

Technic of treatment.—Preliminary treatment is in many cases necessary. In cases without ulceration the surface is simply cleansed with a mild antiseptic solution. In cases with ulceration preliminary exposure to X-rays is sometimes employed. This rapidly cures the ulceration and the part is then subjected to the light. The skin of lupus is very susceptible to light after X-ray exposure, so that in such cases the preliminary treatments are of only about 10 minutes duration. In those cases in which the superficial layers of the skin are very much thickened pyrogallic or salicylic acid ointments are applied to remove these thickened layers and thus permitting deeper penetration of the light rays.

The patient lies upon a high couch or cot, and the part to be treated is brought within accurate focus of the light. The nurse must see that the light falls perpendicularly upon the pressure glass and that firm pressure is constantly made. Each treatment lasts for one hour, occasionally longer. The margins of the patch first receive treatment. Two exposures may cure very mild cases; severe cases may require treatment for six months or longer. When one area is healed the light is shifted to another, and thus the whole surface is gone over. Any sign of recurrence is again subjected to treatment. A good exposure results in bleb formations in about 24 hours. No destruction of the skin results. The part is carefully cleansed and dressed. When healing occurs the light is again applied if there is any sign of a continuance of the disease.

A description of lupus vulgaris will not be attempted, as such a description may be found in any treatise on skin diseases. The following diagnostic points are especially emphasized at the Finsen Institute: The depth of the process, its yellowish color, and the presence of miliary tubercles seen through a glass, making firm pressure upon the surface involved. Lupus does not occur in those affected with pulmonary tuberculosis. It is much more common in females than in males, and it is very commonly located upon the face. Vaccines have been found to be of no value in treatment.

Besides lupus vulgaris, the Finsen light has also been successfully used in the treatment of lupus erythematosus, alopecia areata, rodent ulcer, cancrroid, and acne vulgaris. Some cases of naevus vascularis have been cured and others markedly benefited by the treatment.

The remarkable results of the light treatment in the cure of lupus was demonstrated by a number of patients exhibited, with photographs of these same patients before treatment was begun. Healing results with little or no scarring, depending upon the depth of the destructive process. Seventy-five per cent of early cases and 50 per cent of late cases remain permanently cured in those cases followed for two years or more. All cases are improved, and the percentage of cures is probably much higher than these figures would indicate.

The vaso-dilating and stimulating effects of light are being employed at the institute in the treatment of arterial sclerosis and angina pectoris. The patient is exposed nude, lying on a cot, to the light of two powerful arc lamps suspended a few feet apart. The genitalia and face are covered. Two or three exposures of one hour or more are made on successive days. This exposure causes a dilatation of the capillaries and an erythema which lasts for one or two months. This treatment is not to be used in organic heart lesions, nor in affections of the kidneys. The results of this treatment are said to be very good. Arterial sclerosis is also being treated by exposing the patient to a current of very high voltage and frequency. The patient lies nude beneath a nonconductile frame, across and around which copper wires conveying the current are carried.

This short sketch of the Finsen Institute can not be concluded without expressing to Dr. Forchhammer the sincere thanks of the medical officers of the American Squadron for his kindness and courtesy in showing them the many wonderful things that are to be seen at the institution of which he is the head.



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P R E F A C E .

The publication and issue of a quarterly bulletin by the Bureau of Medicine and Surgery contemplates the timely distribution of such information as is deemed of value to the medical officers and the Hospital Corps in the performance of their duties, and with the ultimate object that both shall continue to advance in proficiency in respect to all of their responsibilities.

It is proposed that the Naval Medical Bulletin shall embody matters relating to hygiene, tropical and preventive medicine, pathology, laboratory suggestions, chemistry and pharmacy, advanced therapeutics, surgery, medical department organization for battle, and all other matters of more or less professional interest and importance under the conditions peculiar to the service and pertaining to the physical welfare of the naval personnel.

It is believed that the corps as a whole should profit, to the good of the service, out of the experience and observations of the individual. There are many excellent special reports and notes beyond the scope of my annual report being sent in from stations and ships, and by communicating the information they contain (either in their entirety or in part, as extracts) throughout the service, not only will they be employed to some purposes as merited, but all medical officers will thus be brought into closer professional intercourse and be offered a means to keep abreast of the times.

Special attention will be given by the instructors of the Naval Medical School to the review of advances in medical science of special professional interest to the service, as published in foreign and home journals, and extracts from these will appear in the bulletin, together with such remarks as the instructors may deem of value to officers on foreign service or sea duty.

Information received from all sources will be used, and the bureau extends an invitation to medical officers to prepare and forward, with a view to publication, matter on subjects relating to the profession in any of its allied branches. But it is to be understood that the bureau does not necessarily undertake to indorse all views and opinions expressed in these pages.

C. F. STOKES,
Surgeon General, United States Navy.

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SPECIAL ARTICLES.

LEAD POISONING FROM INHALATION OF RED-LEAD-LADEN DUST. THE POSSIBLE FREQUENCY OF LEAD ENCEPHALOPATHY IN SUCH CASES.

By Medical Inspector E. R. SMITH, United States Navy.

During my recent tour of duty at the United States Naval Hospital, Canacao, P. I., I had occasion to study three cases of lead poisoning of encephalopathic type where the diagnosis was made in each instance from the presence of marked punctate basophilia, and in which a history of inhalation of dust from dried red-lead paint in compartments which were being chipped to prepare a surface for repainting was obtained.

The first case admitted (B. F. M.) was not recognized at the time. He was admitted with a tentative diagnosis of enteritis, but with a history of a developing psychosis of undetermined nature. The patient was moody, taciturn, and suspicious, and the probability of his case being one of commencing dementia precox of the hebephrenic type was considered.

Five days later J. J. R. was brought to the hospital in a stuporous condition. From a history of probable exposure to estivo-autumnal infection while at Olongapo, an examination of his blood for malaria was immediately made. No parasites were found, but marked punctate basophilia of unusually large irregular splotches in a considerable proportion of the red cells immediately raised a suspicion of lead poisoning. It was impossible to obtain a history of painting, but instead it was ascertained that the patient had been at work chipping old red-lead paint in a compartment of the torpedo-boat destroyer *Chauncey*. The blue line was very marked in this case.

Having in mind the question of the true diagnosis in the case previously referred to, a blood examination was made, and stippling, though of less marked degree than in the second case, was noted. The blue line on the gums was also found to be present. In this case a history of the same kind of duty on the *Chauncey* was obtained.

Not only the interest attaching to these cases, but the importance of such a subject from a service standpoint, naturally caused them to be discussed with line officers as well as with medical officers.

On May 11 a case with epileptiform convulsions was admitted where there was a history of chipping red-lead paint in a compartment on the *Chauncey* and in which a diagnosis of lead poisoning was made by the medical officer on duty at the Cavite naval station. The blood examination in this case showed marked stippling of red cells.

A brief history of these cases is as follows:

Case I. J. J. R., fireman, first-class, age 23. Well-developed man. Admitted April 14, 1911, from U. S. S. *Chauncey*. Condition at time of admission somewhat stuporous. No fever, but malaria being suspected a blood examination was made which showed very marked punctate basophilia, and was negative for parasites. Further examination showed a lead line on the gums. No history of lead painting could be obtained, but one of chipping the old lead coating in a compartment of the ship was elicited. It was learned that much dust was present at the time.

The mental condition of the patient improved slowly under tonic and eliminative treatment. He stated that he felt well but was still somewhat weak. He was discharged to duty May 10, 1911. His full strength not returning satisfactorily he was again admitted to hospital May 20, 1911, where he was under treatment until June 10, 1911, when, his strength having apparently been restored, he was discharged to duty.

He was again admitted September 27, 1911, with a diagnosis of manic depressive insanity and was invalided to the United States and subsequently transferred to the Mendocino State Hospital for the Insane, California. He was under treatment for this mental condition from November 16, 1911, to February 6, 1912, when he was discharged as cured of his psychosis.

Case II. E. F. S., coal passer, age 22. Admitted May 11, 1911, from the U. S. S. *Chauncey* with a diagnosis of venenum neuroticum from lead poisoning incurred while chipping and red leading bunkers on board the *Chauncey* during the previous month (April).

Blue line on gums was present and severe colicky pains were complained of. The diagnosis had been first made, however, by noticing marked punctate basophilia in an examination of the blood. This man had a series of exceedingly severe epileptiform convulsions, some of which lasted almost 30 minutes. Gradually these ceased and the anemia was recovered from. Marked tremors characterized this case. The patient was discharged to duty, "no trace of disease remaining," July 11, 1911.

Case III. B. F. M., fireman, second class, age 24. Admitted April 11, 1911, from U. S. S. *Chauncey* with a diagnosis of enteritis. The

marked manifestations of mental changes, however, caused the psychosis to be studied as a possible early case of dementia precox of the hebephrenic type. Having in mind the diagnosis in the case of J. J. R., we examined this man and noted a faint blue line on the gums. His blood showed fairly well-marked punctate basophilia. He subsequently developed neuritis of both forearms. Under eliminative treatment for the lead poisoning the patient continued to improve and was discharged to duty May 11, 1911.

The three prominent features of these cases are:

1. The inhalation of red-lead laden dust, incident to work at chipping old red-lead paint in confined compartments, as a cause of lead poisoning:
2. The reliability of diagnosis of lead poisoning by blood examination for the presence of punctate basophilia.
3. The question as to whether the introduction of lead through the respiratory atrium is more liable to cause lead encephalopathy than the methods usually obtaining through painting with white lead.

As regards the first consideration there are numerous reports which bear out the frequency of this method of lead poisoning. The most striking instance is that given by Sir Thomas Oliver (Bulletin of the Bureau of Labor, July, 1911), where, in a large factory in Scotland, yarn was dyed yellow by chromate of lead. In the noddling of the yarn dust containing lead was given off and yellow deposits were found on the hair of the women operatives. An instance is cited where, during a period of cold weather, the women operatives closed the ventilators and stopped the running of the fan. An epidemic of acute lead poisoning resulted, with one death from lead encephalopathy. Numerous other instances are cited in the literature of lead poisoning.

As bearing on the question of the comparative poisoning effects of white and red lead, Oliver states that some of his worst cases of plumbism were in red-lead makers; thus contradicting the statement which has frequently been made as to the lesser toxicity of red lead.

Next, as to the second consideration—the reliability of the diagnosis of lead poisoning from the presence of punctate basophilia. P. Schmidt considers that when basophile granules are present in 100 per million of red cells that the finding is pathognomonic of lead poisoning. Oliver goes into the question of the unreliability of this finding rather extensively on account of the importance attached to it by continental physicians. While he does not undervalue punctate basophilia as a sign of plumbism, he considers the diagnostic value of the sign uncertain, he having found the sign negative in 40 per cent of his cases of plumbism.

As regards Rambousek's failure to produce punctate basophilia in rabbits which had been poisoned with lead, I give the following results of some experiments conducted with a view to determining whether blood changes of this nature would develop earlier in rabbits when the lead had been introduced through the respiratory atrium, as compared with rabbits subjected to the effects of lead introduced by cutaneous application and subcutaneous injection:

Rabbit No. 1, weight 1,776 grams, was given 0.06 gram of lead acetate in very dilute solution every day from December 26, 1911, until January 11, 1912. Daily examination of smears stained with Wright's stain failed to show any material changes. There was at times some polychromatophilia, but no punctate basophilia and no nucleated red cells. The differential count averaged about 48 per cent polymorphonuclears, 42 per cent lymphocytes, and 10 per cent large mononuclears and transitionals. When injecting the fluid on January 11, some of the fluid was introduced accidentally into the peritoneal cavity and the rabbit died four days later of a corrosive peritonitis. At autopsy the sites of injection were much indurated and had the appearance frequently seen at the site of salvarsan injections. The appearance was that of a chemical necrosis, and I am convinced that absorption of lead in this experiment was minimal.

Rabbit No. 2, weight 2,050 grams, was placed in a closed compartment, furnished with gauze curtains and an electric fan. Five grams of dried-lead powder were sprinkled on these curtains, and the keeping of them in motion by the fan insured an atmosphere laden with lead dust. A bag was drawn over the rabbit's body so that the dust would not settle on the fur, to be subsequently gotten at by the rabbit. The animal was kept under these conditions for one hour. The experiment was repeated daily from December 26, 1911, to January 11, 1912. Slight polychromatophilia was noted on December 31 and very slight basophilia on January 6 for the first time. The differential count averaged about as follows: Polymorphonuclears, 45 per cent; lymphocytes, 48 per cent; large mononuclears, 7 per cent. On January 6 a very few normoblasts were noted for the first time, the number then steadily increasing until the last day of the experiment, January 11, 1912. These were, however, never so numerous as in the case of rabbit No. 3. The weight of rabbit No. 2 on January 11 was 1,735 grams, a loss of weight of 315 grams.

Rabbit No. 3, weight 1,685 grams, had 5 grams red lead mixed with oil rubbed on the shaven surface of one side of abdomen daily. A bag was then placed over the body of this rabbit, so that he could not reach the lead-smeared surface. At the end of one hour the lead paste was wiped off and the surface cleaned with soap and

water as efficiently as possible. Polychromatophilia was noted on January 2 and very slight punctate basophilia January 4. Normoblasts were first seen on December 30, and became more and more numerous until on January 4 megaloblasts also began to appear. The normoblasts were exceedingly numerous and the blood picture was that of a pernicious anemia. The differential count, however, did not differ materially from that of the other rabbits. The weight of this rabbit on January 11, 1912, was 1,565 grams, a loss of 120 grams.

From these rabbit experiments it would appear that punctate basophilia is of little importance as a sign of lead poisoning. Notwithstanding this and the lack of importance attaching to punctate basophilia as evidenced by the opinions of Sir Thomas Oliver and others, I can not but insist on the usefulness of this sign as of the greatest assistance in the diagnosis of lead poisoning. It was this finding which led us to a correct diagnosis in the three cases above noted.

There is, in my opinion, quite a difference between the punctate basophilia of lead poisoning and that of the secondary anemia of malaria. Malaria is not uncommon in the naval service, and attention to the characteristic that the bluish dots tend to be round and rather small in post-malarial anemia, while in lead poisoning they are larger and more irregular or splotchy may assist in the differentiation of the two affections.

Finally, as to the third consideration, whether the introduction of lead through the respiratory atrium is more liable to cause lead encephalopathy than the methods usually obtaining through paint-with white lead. The statistics as to frequency of encephalopathy as the leading manifestation of lead poisoning vary. In Tanquerel's 1,217 cases there was only about 6 per cent of encephalopathic lead poisoning. In Stewart's chrome bun series 24 per cent of the patients showed encephalopathy. In the small series of cases I have presented all three showed encephalopathic manifestations. During this period, April and May, there were no other cases of the common types of lead poisoning in the hospital. Consequently, it would appear that 100 per cent of the cases developing on this torpedo boat destroyer were of the encephalopathic type.

It would appear to be a question of great importance to determine whether lead poisoning through the respiratory tract, by means of lead-laden dust, is more apt to produce lead encephalopathy than is the case with the better recognized methods of absorption of lead where the symptoms are more commonly those of intestinal cramps or manifestations of neuritis.

LOSS OF LIFE BY DROWNING IN NAVAL WARFARE.

By Surg. T. W. RICHARDS, United States Navy.

Losses in personnel, incident to war, fall naturally into various broad but well-defined groups, and these again may be subdivided and classified according to the particular purpose in view. Thus in reports and statistics distinction is commonly made between losses by sickness and casualties in battle, and the latter may be included under such subheads as "Killed," "Wounded," "Drowned," etc.

Under certain circumstances, however, particularly those following a disastrous defeat, details are often wanting, either through actual lack of precise information on the part of the belligerent concerned or disinclination to publish the same. Furthermore, it makes little difference from a military point of view whether a man is killed, captured, or runs away. For these and similar reasons the total loss may be expressed in one item, such as "killed and missing," or "killed and drowned." Under such circumstances it is not only subsequently impracticable to determine with accuracy the percentage of casualties in any one class, but the actual loss of life as a whole may be largely a matter of conjecture. As will be shown later, the particular class of damage referred to in this paper is especially difficult to estimate with accuracy, and we must rely to a great extent upon methods of approximation.

It will also be obvious that the character, extent, and relative importance of the various losses sustained by belligerents must be vastly modified by a great variety of circumstances, such as the field of war, nature and extent of the campaigns conducted, size, resources, discipline, and experience of the combatant forces, arms and methods of warfare employed, and, especially, *the success or failure of the military operations themselves*. Not only do such conditions influence the damage rates and their distribution during different wars, battles, and minor operations, but they cause great differences from time to time with the same forces in a single campaign. Finally, if we attempt to compare the losses sustained by dissimilar corps or branches of the forces engaged the above statements apply with additional force.

Thus, in extensive operations on land—particularly if the intervals between battles are prolonged—more men, by far, are lost through sickness than by the direct efforts of the enemy.¹ But as the destructive effects of modern weapons, as actually employed, have not kept pace with the development of medical science and the application of hygienic measures, there is a tendency for this dis-

¹ "The losses of the Federal Armies in the Civil War in the two years (June, 1861, to June, 1863) amounted to 53.2 deaths in the thousand, of which only 8.6 were caused by wounds and 44.6 by sickness." In the short Franco-Prussian War, on the other hand, the relative losses from wounds and sickness were as 34 to 30. (See Bloch, *Modern Weapons and Modern Wars*.)

parity to become less marked. Very recent progress along these lines is indicated by such well-known examples as antityphoid inoculation and the salvarsan treatment of syphilis; one tending to prevent disease, the other lessening its duration and severity.

With respect to casualties, we find that of wounds received by troops in battle a large majority—usually some 75 per cent of the whole number—are inflicted by small-arm projectiles.¹

As might be anticipated, naval statistics differ from the above in degree somewhat comparable to the dissimilarity between warlike operations afloat and ashore. On shipboard, exposure to morbid influences is not greatly increased by war, while, in general, sanitary measures are quite readily and successfully enforced, so that the damage from illness is relatively less in the Navy than among troops ashore.² Our casualty lists also differ widely from those of the Army: Wounds from small arms are practically nil, shrapnel—which is generally more fatal to troops than shell—is seldom used, and we find that nearly all wounds on shipboard are due to great-gun fire, inflicted directly or indirectly by explosive shell.

In these brief generalities I have touched upon only a few of the many conditions which, however much they may differ in character and degree, are nevertheless common to warfare as a whole, affecting more or less *all* the forces actually engaged. There remains, however, a hazard of war which is peculiar to the conduct of warlike operations afloat, namely, *drowning*. It thus affects almost exclusively the *naval* forces, the only material exceptions occurring infrequently in connection with over-sea military expeditions, during the

¹ Russian statistics from the recent war (Havard and Hoff: Reports of Military Observers. Mil. Inf. Div. Gen. Staff, No. 8, Part II, Russo-Japanese War) are as follows:

	Rifle.	Shrapnel.	Shell.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Officers.....	71	11	18
Men.....	79	13	8

² In former times sickness on shipboard was, of course, enormously more prevalent, both actually and as compared with other losses, than it has been for many decades.

"Immediately after the defeat of the Armada, for example, disease and great mortality broke out in English ships and rendered them unfit for action; of a crew of 500 men in a certain ship 200 were swept off within three or four weeks."

"On the occasion of Anson's voyage round the world, there were left at the end of the first year (1740-41), on board the three surviving ships of the squadron, only 335 men out of his total complement of 961; that is to say, two-thirds of his men had perished.

"Blockading squadrons outside of Brest had more than once been put hors de combat by disease and had to return home. In the Seven Years' War the navy lost only 1,512 seamen and marines in battle, but 133,708 men—that is, 90 times as many—by death from disease and desertions." (A. Steuzel: The British Navy.)

Such records seem almost incredible when we compare conditions of to-day. During 1898 (year of the Spanish-American War) the death rate in our Navy from disease was only 4.92, and the percentage of sick (excluding injuries) about 2.44. (See Gatewood: Naval Hygiene, 1909.)

transportation or disembarkation of troops; as examples, we have the sinking of the transports *Kowshing* and *Kinshu Maru*.¹

In peace we ordinarily associate the word "drowning" with accidents involving the death of one or a few individuals, since great naval disasters like the ramming of the *Victoria*—when 358 lives were lost—are exceedingly rare.² Even in the merchant marine, such occurrences are exceptional, with the safeguards to navigation in use to-day. When occurring, they are almost always due to collision on the high seas, and appalling loss of life may be aggravated by the horrors of panic among passengers.

To the Navy, however, drowning *in warfare* has a far broader significance, implying possibilities of wholesale loss of personnel, which often embraces an entire ship's complement and is invariably incident to total destruction of the vessel itself. As so construed, it has been generally recognized that the questions presented are of grave importance, which has often been expressed in rather loose generalities, and perhaps exaggerations, regarding the extent of the damage so sustained. It seems desirable, therefore, to indicate what this damage has been and to form some estimate of what may reasonably be anticipated in a naval war of the immediate future. To these ends it becomes necessary to examine, briefly, records of the past, and to inquire particularly into the circumstances attending the *sinking* of vessels of war, since as already indicated these will determine practically all the major losses due to submersion. Developments in naval warfare have been so radical within recent years that to obtain data based upon conditions which in any degree approximate those of to-day we must confine our investigation to the era subsequent to our Civil War, which marked the change from wood to steel, from sail to steam. Furthermore, since naval operations tend more and more toward concentration of forces, so that actions between individual ships or small units are now relatively unlikely and of lessening importance, it would seem that our attention could be most profitably directed to battles involving squadrons and fleets. While this is true as a general proposition, it will never-

¹ The *Kowshing* was a British steamer chartered by the Chinese in July, 1894, to carry troops to Korea. On the 25th of that month, with 1,100 men on board, she encountered four Japanese cruisers. She was hove to and boarded by an officer from the *Naniwa*, commanded by Capt. Togo (afterwards commander in chief during the Russo-Japanese War). Demand was made that the *Kowshing* surrender, though the vessel flew the British flag and had sailed in peace. The Chinese absolutely refused compliance, though urged to accede by European officers on board. The Japanese returned to their ship, and a few minutes later the *Naniwa* opened fire at a distance of only 200 to 300 yards; she also fired a torpedo. The *Kowshing* remained afloat for nearly an hour under a pitiless fire, when she slowly sank. At least 700 lives appear to have been lost in this affair.

Somewhat similar circumstances arose when the Russians sank the Japanese transports *Kinshu Maru* (Apr. 25, 1904), and the *Hitachi*, *Sado*, and *Izumi* (June 15). The total number killed or drowned on the *Hitachi Maru* alone is believed to have been about 1,000; reliable statistics for the other vessels are not available, but the loss was much less heavy.

In considering the strictures expressed regarding the sacrifice of life in these operations, the refusal of the troops to surrender when granted the opportunity should be borne in mind.

² Even in peace, drowning is usually responsible each year for more deaths in the naval service than any other one cause.

theless appear that there have been a number of individual catastrophes, the records of which are informing, because the attendant circumstances are better perceived than is possible in the case of great fleet engagements, where it is always difficult to form an accurate mental picture of any particular incident in the kaleidoscopic movement.¹

Within the limitations so imposed there have been several wars, each of which was marked by one or more great naval actions, the more important of these being known as the Battles of Lissa, the Yalu, Manila Bay, Santiago, and the Sea of Japan, more commonly called Tsushima.

The Battle of Lissa (June 27, 1866) was fought during the transition period of naval armaments, each belligerent having a heterogeneous fleet, consisting of both wooden and armored vessels. Of the former we need give little account. On the Italian side they took no active part in the battle, but the Austrians handled their old unprotected ships most gallantly, the *Kaiser*, flagship of Commodore Petz, particularly distinguishing herself. She succeeded in ramming the armored *Portogallo* (sister ship of the *Re d'Italia*), delivering a glancing blow fairly amidship, but inflicting less damage than she received herself.²

It will be remembered that the Austrian admiral, Tegethoff, engaged (at 10 a. m.) in a V formation, with his armored ships in the van, his tactics throughout the battle being admirably summed up in his celebrated order "Ram everything gray." If the Italians had any plan at all they soon lost sight of it when their admiral, Persano, at the very last moment threw his formation into confusion by stopping the *Re d'Italia* and transferring his flag, unknown to his subordinates, to another vessel. A long gap was thus formed between the first and second divisions, through which, in the smoke and confusion, the Austrians blundered, to their own surprise and great good fortune of the enemy. The battle now became a *mêlée*. Tegethoff, true to his principles, made several ineffectual attempts to ram with his flagship, the *Ferdinand Max*, a vessel of some 5,000 tons, carrying 5-inch armor. Suddenly, about 11.20 a. m., through the thick cloud of smoke, he saw a great gray mass stationary in the water. The order "full speed ahead" was given, and a moment later the prow of the *Max* was driven, without severe shock, through the collapsing decks, frames, and armor of the *Re d'Italia*. "The *Italia* was careened far over to starboard by the impact. Then, as the *Maximilian* withdrew her ram from the deadly wound, the great Italian ship rolled back almost on her beam ends and sank, without righting, bow first be-

¹ "Le bataille * * * est, comme toutes les batailles navales, assez difficile a reconstituer, par suit de la disparition des temoins importants ou de l'impossibilité pour une partie des survivants de donner des renseignements precis. Une bataille terrestre s'accroche a certains episodes faciles a ressaisir grace au terrain." (L. G. Laur; *Tsushima*.)

² The casualties on this ship were more than half the entire number suffered by the Austrians, viz, 24 killed and 75 wounded from a total of 38 killed, 176 wounded.

neath the waves, leaving the water strewn with struggling human beings."¹ All accounts of this incident agree in stating that the stricken ship, a vessel of 5,700 tons, carrying 7 inches of armor, gave but one roll, sinking as she listed to port—a destruction almost unparalleled in its rapidity.²

The *Ferdinand Max* and some Austrian gunboats immediately attempted to lower boats to rescue the drowning crew, but were prevented from so doing by the fire of several Italian ships, probably because in the smoke the latter did not appreciate just what had occurred. The victims of this disaster were thus left to their fate, but an extraordinary circumstance, thus recorded by Wilson, prevented their complete annihilation:

The survivors of the *Re d'Italia's* men were on the point of drowning, when suddenly there came an upward rush of water, caused perhaps by the explosion of her boilers, which carried to the surface timber and fragments to which the survivors clung.³

This wreckage was not discovered until the action was over, probably more than an hour after the ship sank, when 166 survivors were picked up by the Italians, 400 persons having drowned in the meantime.

The only other vessel destroyed during this battle was the Italian armored gunboat *Palestro*, 2,000 tons. She was set on fire and severely punished early in the action. The flames spread beyond control, and though her magazines were flooded an emergency store of ammunition was overlooked. At 2.30 p. m. she blew up, only 19 of her complement of 230 surviving. In this and many similar instances it is obviously impossible to positively determine the relative numbers of the killed and drowned. Since the destruction of the ship was known to be inevitable—though the explosion was not anticipated—it is reasonable to assume that most of the crew were on deck; and if so, that not more than half the crew were killed outright. In other words, the loss of life was probably twice as great as it would have been had the explosion occurred on land. This difficulty, however, is not insurmountable and will be referred to later.

In reading the records of earlier sea fights one is struck by the relative frequency of occurrences like the above. It might almost be said that the natural end of the old ship of the line was due to fire, not water.⁴

¹ Naval Battles in the Nineteenth Century, Rear Admiral F. J. Higginson, U. S. Navy.

² The *Victoria* remained afloat 10½ minutes, though many of her water-tight doors were open.

³ Ironclads in Action, H. W. Wilson.

⁴ No vessels were actually sunk during the battles of the Nile and Trafalgar, but on each occasion one or more ships exploded. At Copenhagen most of the Danish ships were taken or burnt. "The *Dannebrog* (flagship) caught fire and blew up after the action." (Willmot: Our Navy for a Thousand Years.) At Navarino (1825) one of the fiercest naval battles ever fought, the Turks and Egyptians "stood by their vessels till they were wrapped in flames, and they could be seen rushing from point to point about their decks and climbing into the rigging to escape death by fire. But there was no escape; ship after ship blew up and blazed fiercely, making the bay a mass of charred wreckage illuminated by burning hulks." (Higginson).

As an exception, the *Vengeur* was sunk (Battle of the First of June, 1794), 400 of her crew being rescued by boats from the English fleet.

From a consideration of all the data available, the following estimate of the Italian losses in this battle appears to be approximately correct:

Killed (by gunfire).....	5
Drowned (or killed with sinking vessels).....	615

At the Yalu¹ all the ships engaged were armored, or at least "protected," vessels of iron or steel, and this battle is said to have been "in a way the most important sea fight since the time of Nelson" (Higginson). It will be unnecessary to go into tactical details of the action in general. The Chinese, under Admiral Ting, approached in line, with their heavier ships in the center, but as the wings consisted of slower vessels the formation was actually crescentic. The Japanese advanced in column, with a fast squadron in the van which swept around the weak Chinese right and attacked from the rear, while the main squadron concentrated on the same position from the front. As has so often happened before and since, the losing side soon became a confused "mob of ships." In addition to their initial tactical advantage, the Japanese fire was far more effective than their enemy's. The latter fired slowly and at random, but their heavier guns caused great execution when a shot did take effect on the unarmored ships of the Japanese.

Considering the damage inflicted on both sides, it seems somewhat surprising to find that only two ships, both Chinese, were actually sunk in action,² viz, the unarmored *Chih Yuen*, 2,300 tons, and the *King Yuen*, 2,850 tons, with 9.4 inches of armor. The *Chih Yuen* was hotly engaged early in the action; after being hit repeatedly she listed heavily to starboard and slowly sank by the bow, going down with all hands. She was destroyed by gunfire alone (a 12-inch shell is said to have finished her career), but a violent explosion occurred as she sank, either due to her boilers or to a torpedo on board (3.30 p. m.).

About 20 minutes after this catastrophe the *King Yuen*, already on fire, received the concentrated fire of the *Yoshino* and *Takachio* and also withstood a hail of projectiles from one ship after another of the flying squadron. She was subsequently seen to be rolling heavily, and at 4.50 p. m. sank, stern first. "Her end is veiled in mystery. All the Chinese who saw her go down attributed her loss to a torpedo, but the Japanese fired none. There was a very thick cloud of smoke and an explosion just before she vanished, like the *Victoria* capsizing and showing her bottom. Of a crew of 270 men only 7 escaped." (Wilson.)

¹ See "Acciones Navales Modernas," por J. de Salas, Teniente de Navio.

² Of course this does not represent all the Chinese ships that were lost. Many suffered greatly from fires, and one, the *Lai Yuen*, literally burned out. The *Yang Wei* is sometimes referred to as having been sunk; she was set on fire and withdrew, later being in collision with the *Tsi Yuen*, and appears then to have been run aground and abandoned. She was torpedoed next day by the Japanese.

The destruction of these two Chinese ships is thus curiously alike. It has been suggested that one or both struck live torpedoes, fired by the Chinese, which may have been floating about in the water, but it is much more probable that in each case sinking was due to gunfire alone.

The Japanese casualties in this fight were, all told, 90 killed and 204 wounded. On the Chinese side the percentage of injuries from gunfire was much smaller (on seven surviving vessels, 36 killed and 88 wounded), owing to their armor protection, but on the ships which were sunk the loss of life is estimated to have been from 600 to 800. The total force on each side was about 3,000; as there were only 10 Chinese ships seriously engaged it thus appears that 20 per cent of these vessels were sunk in action and that the loss of life from drowning was proportionately heavy.

Four years after this conflict the two naval battles of our late war were fought, the Spanish ships engaged being captured or destroyed. Although of such peculiar interest to us, there appears to be little data obtainable therefrom which is pertinent to the subject of this paper. This is owing in great part to the very completeness of our success in each engagement. The Spanish fought their ships bravely, but the disparity in strength of the fleets led them to discount disaster beforehand. Thus each battle was fought close inshore, and the ships were grounded or partly sunk in shoal water when their destruction became inevitable. Those in Manila Bay were apparently abandoned without serious difficulty, though precise information is lacking. With the punishment received it would seem that their own boats would have been unserviceable, even for the short trip required. The total loss, as reported by Admiral Montojo, was 381 killed and wounded, probably an underestimate, but this does not appear to include any material loss by drowning, and it seems likely that very little occurred.

At Santiago the situation differed in details. Although all the larger vessels and the destroyer *Furor* were actually beached,¹ all except the *Colon* were blazing furiously, and it seems inevitable that many men drowned as they were forced overboard by fire. Our own ships were prompt and active in the work of rescue and undoubtedly saved many who would otherwise have lost their lives in attempting to reach the shore. Rear Admiral Higginson, in his description of this battle, accounts for the entire Spanish force as follows: "Thus four beautiful Spanish ships and two destroyers had gone to their death before the overwhelming fire of the American vessels, and of the 2,300 Spaniards who entered the conflict, 350 were killed, 200 wounded, 150 escaped by swimming ashore, and 1,600 surrendered."

¹ The destroyer *Pluton* was sunk, but I am unable to find any estimate of her casualties. Probably our vessels rescued many of the crew.

Judging from the small proportion of wounded it seems that the "killed" may here include all not otherwise accounted for and that the number drowned will never be known. But in any event, one lesson seems clear: Had these battles been fought on the high seas they must have resulted in early surrender of the Spanish ships or an appalling loss of life, probably proportionately greater than that of any sea fight of modern times.

Coming now to the most recent and greatest of modern wars, we will find in the Russo-Japanese conflict a mass of data which should be particularly informing. Owing to the extent of the naval operations even reference to them all would be quite impracticable within the limits of this paper, but the briefest outlines will serve to connect the following incidents more or less consecutively:

The first vessel sunk with great loss of life was the Russian mine layer *Yenesei*. On February 11, 1904, while engaged in her special work in Tahin Bay, she struck a mine which had just been planted, sinking in less than 20 minutes with 4 officers and 89 men.¹ About a month later the destroyer *Steregushchi* was cut off, disabled and surrounded by the Japanese as she was attempting to reenter Port Arthur. Although she was in a sinking condition, an effort was made by her captors to tow the boat out, but the line parted. Attempts were then made to rescue the crew, but she sank with all hands except 4 men.

After having made several unsuccessful attempts to bottle up the Russian ships in Port Arthur, Admiral Togo decided to harass this force by dropping mines within the area commonly chosen by the Russians in their maneuvers outside the harbor. This operation, one of the first of the kind ever attempted, was secretly accomplished on the night of April 12, and its extraordinary success resulted in one of the most dramatic incidents of the war. Early the following morning the destroyer *Strashni*, after a 15-minute engagement with two Japanese boats, was sunk off the harbor, 5 men only being saved. Thereupon the Russian ships steamed out, the battleship *Petropavlosk*, flying the flag of Admiral Makaroff, in the lead, and proceeded on their usual course under the batteries. "Suddenly at 9.40 a. m., a loud report was heard, and the eyes of everyone in both fleets were turned on the Russian flagship. She had struck a mine. The first explosion was followed by a second, and that again by a third, a vast cloud of smoke and steam hung over the water, and when it lifted the *Petropavlosk* had disappeared. Of her whole crew only 7 officers

¹ The moral effect of such sudden loss by drowning is well illustrated by an incident which occurred shortly afterwards. When news of the *Yenesei's* destruction reached Port Arthur, the *Boyarin*, with four destroyers, was dispatched to Ta-lien Bay. As she was about to anchor she struck a mine. "All boats were immediately lowered, the ship was abandoned, and the crew was transhipped to the destroyers, which had approached directly the explosion had occurred." The destroyers steamed back to Port Arthur, but instead of sinking, the *Boyarin* drifted about the bay for two days, finally going down during a violent gale and snowstorm.

and 73 men were picked up, and with her perished the celebrated painter Vereshchagin."¹ It is stated that "all spectators of the disaster * * * are agreed that the second explosion occurred in the magazine and the third in the boilers."²

So far, the damage had been chiefly on the Russian side, but the Japanese did not escape their contributions. In sweeping for mines in Kerr Bay (near Port Arthur) two torpedo boats were sunk and 8 lives lost. On May 15 a much more serious misfortune occurred, due to the Russians having adopted the methods which had proved so effective against themselves a month earlier, that is, they strewed mines on the high seas off Port Arthur.³

About 10 a. m. the Japanese battleships traversed this field, with disastrous consequences. The *Hatsuse* promptly struck a mine which disabled her helm "and a few minutes later the *Yashima* also struck a mine, or possibly two mines together. When the first explosion occurred preparations were made for taking the *Hatsuse* in tow, but before they could be completed she struck a second mine, which * * * seems to have exploded one of her magazines. The effect was similar to that on the *Petropavlosk*. An enormous cloud of steam arose and the *Hatsuse* disappeared in about a minute and a half." (British Official History.) Four hundred and ninety-four⁴ lives were lost in this catastrophe. The *Yashima* also sank some hours later, after being abandoned, however, by her crew. The loss of this vessel was successfully concealed by the Japanese until some months later.

On the 25th of May the Japanese sustained still further loss, the cruiser *Yoshino* being rammed and sunk by the *Kasuga*. The accident occurred in a dense fog, which prevented the other vessels from rendering much assistance. She sank as some of her boats were being lowered and they were swamped—from a crew of about 400, all told, 335 were drowned. To complete this series of disasters, the destroyer *Akatsuki* was sunk by a mine with the loss, it is said, of all her officers and 16 men; the rest of the crew were picked up by other boats in the flotilla.

¹ British Official History of the Russo-Japanese War, Vol. I.

² The Russian troubles on this occasion did not end with this disaster. At 10.15 the *Pobryda* also struck a mine; though badly injured she managed to remain afloat and regained the harbor.

³ These were floating, contact mines, left to drift indefinitely, far and wide. They became a serious menace to neutral vessels, the Chinese being the greatest sufferers. Their delegates at The Hague Conference of 1907 said that: "Their Government was still obliged (two years after the war) to furnish its coasting vessels with special instruments to remove and destroy the floating mines which encumber not only the high seas but also its own territorial waters * * * and from five to six hundred Chinese citizens * * * have suffered a cruel death from these dangerous engines of warfare." (See The Two Peace Conferences, W. H. Hull.) The question as to the use of such mines was the subject of much discussion at this conference, and the rule finally adopted forbids the use of unanchored mines unless so constructed as to become harmless within one hour after their control has been lost. (Article I, Eighth Convention, Second Hague Conference.)

⁴ Unless otherwise noted, Japanese statistics are from the "Report on the Naval Medical and Sanitary Features of the Russo-Japanese war to the Surgeon General, United States Navy," by Surg. W. C. Braisted, United States Navy.

Other Japanese vessels destroyed by mines during 1904 included the coast guard ships *Kaimon* and *Saiyen* and the destroyer *Hayatori*. While the loss of life amounted, in all, to about 90 officers and men, these were minor events, and the list may be concluded with the following serious disasters: On September 18 the gunboat *Haiyen* was engaged in guard duty in Pigeon Bay and about dusk she struck a mine. She sank at once, her boats being swamped by a heavy sea then running. In spite of assistance from another ship close at hand, only 4 were saved from her complement of 201 officers and men. About three months later the cruiser *Takasago* was lost under somewhat similar circumstances off Port Arthur, 298 lives being lost.¹

The first great sea fight of the war occurred on August 10, when the Port Arthur fleet endeavored to force a way to Vladivostock. Although this action resulted in the practical elimination of the Russian ships as a fighting force, none were sunk. Six of the larger vessels, badly crippled, returned to Port Arthur, where they were eventually blown up and sunk by the Russians; the rest were beached and abandoned or reached neutral ports, to be interned during the remainder of the war.

Four days later the Vladivostok squadron, consisting of the cruisers *Rossia*, *Rurik*, and *Gromoboi*, made a sortie, and, meeting the Japanese under Kamimura, a running fight ensued, lasting five hours. The *Rurik*, being too slow to keep up with the others, received the severest punishment and, having been pierced below the water line aft, finally sank by the stern, her whole crew being thrown into the water, as she had no boats intact. The Japanese ships' boats and torpedo boats promptly came to the rescue and picked up over 600 men, many of whom were badly wounded.² This incident is most exceptional, and it is of particular interest as demonstrating the possibility of rescuing practically an entire crew under battle conditions.

With these events naval operations of importance inevitably ceased for the time being, to be resumed with the arrival of Admiral Rodjestvensky's fleet and the Battle of Tsushima, May 27-28, 1905.

The great number of ships engaged in this battle, its extent and duration, and the eventual dispersion of its component units—resulting in several more or less independent secondary engagements—preclude any attempt to give a concise, yet clear and connected, account of the whole series of events. The general details, however, are so familiar that it seems only necessary to summarize the circumstances attending the destruction of certain Russian ships, bearing in mind that no Japanese vessel (except torpedo craft) was lost or even seriously damaged.

¹ "Arch. de Med. et Phar. Navales," August, 1911.

² T. Cowan. "The Russo-Japanese War."

BATTLESHIPS.¹

Oslabia.—Head of second division. “Was set on fire and sunk by gunfire. Driven out of line in less than 30 minutes after battle began; floated 30 minutes longer.”

This vessel was struck by three large projectiles about the water line. She listed more and more to port, capsizing as she sank. The stability of many of the Russian vessels is said to have been impaired by the excessive amount of coal stowed in every available space, including some of the officers' staterooms; little of this extra supply was used, as that in the bunkers was first drawn upon. Unless a ship capsizes suddenly, it would seem that this event does not necessarily lead to increased loss of life. On the contrary, if the preliminary list is slow and extreme, it might serve to relieve the men below, who would otherwise inevitably be drowned. Some 200 survivors were picked up in this instance by two Russian destroyers, a greater number than is recorded for any other battleship sunk under similar circumstances.

Suvaroff.—Head of first division; flagship of Admiral Rodjestvensky. “Was set on fire before 2.45 p. m. Driven out of line in less than 40 minutes after battle began;² floated 4 hours and 40 minutes longer.” She was attacked three different times by destroyers and sank at 7.20 p. m.

This ship was naturally selected for concentrated attack and suffered terribly from gunfire before and after she left the line. Semenoff estimated her casualties to be greater than those of the entire Japanese fleet. While this may be an exaggeration, it seems altogether probable that not more than half her complement—over 900—were living at the moment the ship sank. Most, if not all, of these must have drowned. The Admiral and his staff left the ship, and a destroyer was sent to search for her and take off her crew, but she could not be found. If any of her crew were picked up, there seems to be no record thereof.

Alexander.—Second of first division. “Set on fire and sunk by gunfire. Driven out of line in less than 40 minutes after battle began.” According to Semenoff, she sank at 5.30 p. m.

The *Alexander*, like the *Borodino*, was a sister ship to the *Suvaroff* and received similar punishment. I can find no reference to the fate of her crew. Doubtless there were a number of individual survivors, but no general rescue.

¹ See Wainwright, Richard, captain, United States Navy. (Proceedings United States Naval Institute, December, 1905.)

Also Journal Royal United Service Institution, September, 1906. Many of the following details are from the article on this battle translated from the *Marine Rundschau* by Capt. R. H. Anstruther, Royal Navy.

² The Russians opened fire at about 2.08 p. m.

Borodino.—Third of first division. "Set on fire at 6.40 p. m. At 7.23 a serious explosion, probably magazines, took place and she sank instantly. Driven out of line in 4 hours and 30 minutes after battle began; floated 43 minutes longer."

Semenoff was on a destroyer near at hand when she sank. He says: "'Look; the *Borodino*,' was shouted on all sides. I raised myself as quickly as possible on my arms, but where the *Borodino* had been nothing was visible save a patch of white foam." He makes no mention of any attempts at rescue, but the Japanese cruiser *Kasuga* is known to have picked up 40 of her crew.¹ There is no doubt but that these were practically the only survivors.

Sissoi Veliki.—Second in second division. Torpedoed during night of 27th and sank about 10.30 next morning. After working all night to keep her afloat attempts to construct rafts were being made in the morning "when the *Monomach*, with a heavy list to port, and the destroyer *Iromki* were seen approaching. The *Monomach* would not take the crew on board, as she was expecting to go down herself every minute. The destroyer could only take a few, so the captain of the *Sissoi Veliki* refused her help. An hour later three Japanese transports came on the scene and saved 570 men."²

Navarin.—Ship received little damage during daylight 27th. Torpedoed twice during night and twice next day; sank at 2 p. m. 28th. "The crew remained at their stations until the pipe 'All hands on deck.' The attempt to get the undamaged boats in the water failed. * * * Of the whole crew only three men were saved, two of whom were picked up by a British steamer the following afternoon."

As the casualties on this ship had been comparatively few, practically her entire crew were drowned, the most extreme case of the kind on record.

Admiral Nakimoff.—Fourth in second division. "Torpedoed night of 27th. Sank at 10 a. m. 28th."

The crews of this ship and the *Monomach* were taken aboard the *Sado Maru* and destroyer *Shirani* about 10 minutes before they sank. (De Cuverville.)

¹ Brassey's Annual, 1906.

Vice Admiral De Cuverville states (Les Leçons de la Guerre) that during "The 28th and 29th of May, more than 2,000 Russians, officers and sailors, came aboard (the Japanese ships) in boats or were picked up at various places on the coast. Some of them succeeded in going as far as Hamada, a hundred miles from the scene of the action."

² "The auxiliary ships *Shimano Maru*, *Tainau Maru*, *Yanata Maru*, *Sado Maru*, also a certain number of destroyers, had been directed to scour over the field of battle to collect the survivors." (See *La Lutte pour l'empire de la mer*, par René Daveluy, capitaine de frigate.)

This procedure accords with the provisions afterwards incorporated in article 16, Tenth Convention, Second Hague Conference, 1907, which provides that: "After each engagement the two belligerents shall, so far as military interests permit, take steps to search for the shipwrecked, sick, or wounded, and to insure them, as also the dead, against maltreatment." This article is not found in the convention of 1899, but similar measures are enjoined upon belligerents after battles on land by the Geneva Convention. In view of the inevitably wide dispersion of the units during a great fleet action the importance of this humanitarian measure is likely to become increasingly obvious.

COAST-DEFENSE SHIP.

Admiral Ouchakoff.—Second in third division. Leaking from hits in action 27th. Surrounded next day, a Japanese ship flying signal: "We advise you to surrender. Admiral Nebogatoff has given himself up." In answer the *Ouchakoff* opened fire, a council of officers (called by the captain) having unanimously decided to fight to the end. After an hour's fight, began to sink, and captain ordered her valves to be opened and crew to save themselves. Eighty were drowned.

ARMORED CRUISERS.

Dmitri Donskoi.—Under heavy fire 28th, losing in two hours 60 killed and 120 wounded. After this action valves were opened and ship sunk in deep water. Crew reached shore or were rescued by *Kasuga*.

Vladimir Monomach.—"Torpedoed in the night of 27th. Sank at 10 a. m. 28th." Her crew were taken off with the *Nakimoff's*.

CRUISERS.

Svietlana.—Fought to the last, morning of 28th. After an hour's action, with heavy casualties, captain ordered the sea cocks opened. "He remained on the bridge as the crew jumped overboard; the second in command was killed as he was trying to rescue the wounded. The ship went down in deep water about 11.35, and the Japanese steamed away to chase the *Donskoi*. About 5.30 p. m. 10 officers and 100 men (out of 440) were picked up by the *America Maru*, of whom 22 were wounded men lashed up in their hammocks." These evidences of care and rescue of the wounded are of particular interest.

AUXILIARIES, TRANSPORTS, ETC.

Ural.—Sunk after being abandoned. Crew taken aboard *Anadir*.

Kamtchatka.—Sunk in action about 7 p. m. 27th. Fate of crew uncertain.

Ilitis.—Sunk in action about 7 p. m. 27th. Fate of crew uncertain.

Angier.—Sunk in action about 7 p. m. 27th. Fate of crew uncertain.

Russe.—Sunk in action about 7 p. m. 27th. Fate of crew uncertain.

Irtish.—Sunk in action about 7 p. m. 27th. Fate of crew uncertain.

Details regarding these ships are not available. Some were sunk quite early, when opportunities for rescue were seldom at hand, so altogether they probably contributed their quota to the list of drowned.

In addition to the above, five destroyers were sunk.¹

In proceeding now to an analysis of the above data, it will be expedient to consider first the statistics on the Japanese side, as these are much the more complete and accurate.

The total number of fatal casualties in the Japanese navy during the entire war, including the drowned, killed, and deaths from wounds, was 1,991. Of these, no less than 1,399²—over 70 per cent—occurred on ships known to have been sunk, three vessels alone (*Hatsuse*, *Yoshino*, and *Heiyan*) accounting for more than half the whole number. Undoubtedly cases of drowning occurred on other ships, while, on the other hand, many men were killed outright in the explosions following contact with mines. The proportionate number of the latter can never be determined, but from a practical point of view it does not greatly minimize the relative importance of drowning as a damage factor to admit that on a ship going down with all hands some lives were snuffed out a moment before her disappearance. Therefore from all the facts at present available, I believe it may be reasonably concluded that in the Japanese Navy *drowning caused many more deaths than gunfire* and its fatalities exceeded in number those from all other casualties.

Any estimate of the Russian losses must necessarily be more or less tentative, subject to revision when, if ever, more exact statistics are published. It should be noted, however, that for our present purpose we are less concerned with the actual loss of life than with a determination of the relative importance of the various factors causing the same, and from this point of view the subject is somewhat more approachable. With the data available, there appears to be no satisfactory means of directly determining the number or proportion of deaths from drowning at Tsushima, for instance, but it seems possible to arrive at some definite results by a process of elimination; that is, by estimating, first, the damage from gunfire and other causes.

¹ To complete the list of Russian ships the following is appended for reference:

Nicholas.—Surrendered; Nebogatoff's division.

Argol.—Surrendered with Nebogatoff's division. (Fourth ship, first division.)

Sciatvina.—Surrendered; Nebogatoff's division.

Amazine.—Surrendered; Nebogatoff's division.

Izumrud.—Escaped, but sunk on rock in Vladimir Bay.

Almaz.—Escaped to Vladivostok.

Anadir.—Escaped to Diego Suarez.

Korea.—Escaped to Woosung.

Svir.—Escaped to Woosung.

Oleg.—Escaped to Manila. Enquist's division.

Aurora.—Escaped to Manila. Enquist's division.

Jemichug.—Escaped to Manila. Enquist's division.

Kotroma (hospital ship).—Captured, but released.

Orel (hospital ship).—Captured and condemned.

² These figures are from the Official Report on the Organization and Operations of the Medical Department of the Japanese Navy during the Russo-Japanese War. Extracts from the above have been translated into French by M. le Dr. Chemin, médecin de première classe, but unfortunately had not been published when this paper was originally written. See Arch. de Med. et Phar. Navales, August, 1911.

In the first place it is clear that the Russian loss from wounds was enormously greater—both actually and relatively—than that of their enemy, due primarily to the much better gunnery of the Japanese. This has been estimated by Japanese and British observers as resulting in two hits to one—gun for gun—early in the war, and as many as four to one at Tsushima, the Japanese shooting having greatly improved. Consequently some of the ships when finally sunk had been terribly punished already, and their complements may have been reduced more than half by shell, fire, and suffocation (e. g., *Suvaroff*, *Borodino*, *Alexander*, *Oslibia*, etc.). These cases are in quite a different class from those vessels sunk with explosion, where the two factors causing death acted simultaneously and were practically inseparable. The Japanese lost no ships in action; sinking was more or less an accidental occurrence, menacing the whole crew, and of these disasters the Russians also had their full share. Up to the battle of Tsushima the record is fairly complete, the principal losses in action being as follows:

	Men killed.
Variag.....	31
Battle of Aug. 10.....	80
Battle of Aug. 14.....	320
Total.....	431

During the same period there were lost by the sinking of the—

	Lives lost.
Yenesei.....	93
Petropavlosk.....	625
Strashni (about).....	75
Total.....	793

Most of the latter may fairly be attributed to drowning, inevitably associated with the submersion of the ships. But making due allowance for contributory causes and adding miscellaneous casualties occurring in minor operations to the 431 noted above, there is still a heavy balance in the list of drowned.

Regarding Tsushima itself, Daveluy says: "Of the 14,200 men who manned the Russian squadron, 6,142 became prisoners; 5,000 had disappeared." Braisted² states that "the number of missing is variously estimated at from 5,000 to 8,000," while the lowest figures available give the actual loss of life as "about 4,000." It seems conservative, therefore, to assume that some 30 per cent of the entire force perished in this engagement.

It has been generally believed that about 20 per cent is an average casualty list to be anticipated from gunfire in naval battles, and that only 4 per cent will be killed outright, though I think this will prove far too low an estimate for any force which suffers defeat. On the

¹ British "Official History."

² Loc cit.

other hand, there is probably a *maximum* death roll, seldom to be exceeded, beyond which it might be actually disadvantageous for the victor to inflict further penalty by *gunfire*. This would seem to have occurred when practically all hands above the armored deck had been killed or disabled, the guns put out of action, and the ship herself rendered incapable of escape. At this stage it will generally be more expedient to deliver the final blow by torpedo attack rather than to expend ammunition which might be indispensable elsewhere.

Such a condition of helplessness would inevitably exist on ship-board when the vessel had lost in *killed alone* 25 to 30 per cent of her complement; allowing at this stage only three men wounded to every two killed and we account for about all the crew outside the ammunition passages, engineering department, and other positions below decks.

The fact that the proportion of "killed" to "wounded" rises rapidly as the percentage of total casualties increases does not seem to have been generally appreciated. This is well illustrated by the following (Russian) examples:

	Killed and wounded.	Killed.	Wounded.
	Per cent.	Per cent.	Per cent.
Battle of Aug. 10.....	—8	—1.3	—6.6
Battle of Aug. 14 (all ships).....	36	13	23
Battle of Aug. 14 (Rurik only).....	52	22.5	29.5

The running fight of August 14 was particularly disastrous to the Russians, but their fatalities did not reach 14 per cent. Upon this occasion the *Rurik* suffered much more severely than the other cruisers. Subjected, as we have seen, to terrific gunfire for several hours and finally sunk, her list of killed ran up to an exceptional figure, 22.5 per cent.

Now, there is no doubt but that on some or all the battleships sunk on the 27th this rate was exceeded, perhaps reaching 30 per cent, and, on the *Suvaroff*, even more. But it is also evident that a large majority of the Russian ships sank, surrendered, or escaped long before they were reduced to the *Rurik's* plight; for example, the three large vessels of Enquist's division, which reached Manila, had only 37 killed, all told. From consideration of these circumstances and those attending the various individual ships in action I am led to believe that the *average* loss by gunfire for the whole fleet may have reached 12 per cent, a very high mortality indeed; it is generally assumed to have been much less.

On nearly all the Russian ships which were seriously engaged fires were frequent and severe. One of the points raised by Admiral Nebogatoff in his own defense and arraignment of Admiral Rodjestvensky referred to the large amount of woodwork which had been

retained on board the vessels of the first and second divisions, Nebogatoff having had his own ships stripped before the battle. In view of the well-known experience of the Chinese ships at the Yalu and those of the Spaniards at Santiago, it is certainly remarkable that greater precautions were not observed to prevent these disasters. As a result, the fighting efficiency of the ships was not only hopelessly impaired, but there was much unnecessary loss of life from direct action of fire, exploding ammunition, and, particularly, asphyxiation. In judging the extent of the damage thus inflicted Semenoff's graphic picture of conditions on the flagship is especially informing. Referring to the time (5.30 p. m.) Admiral Rodjestvensky was leaving this vessel, he says: "The mess deck was in darkness (the electric light had gone out) and was full of suffocating smoke. Hurrying along to find the staff, we called them by name, but received no answers. The silence of the dead reigned in that smoky darkness, and it is probable that all who were in the closed compartments under the armored deck, where the ventilators took smoke instead of air, gradually became suffocated, lost consciousness, and died. The engines had ceased to work. The electric light had given out for want of steam; and no one came up from below. Of the 900 men comprising the complement of the *Suvaroff* it would not be far wrong to say that, at this time, there remained alive only those few who were gathered together in the lower battery and on the windward embrasure."¹

As these conditions were reproduced more or less fully on three other battleships, an average of about 100 deaths on each—say 3 per cent of the fleet complement—has been attributed to this cause.

These approximate results may accordingly be summarized as follows:

	Per cent.
Killed by gunfire.....	12
Killed by fire, asphyxiation, etc.....	3
Drowned.....	15
Total.....	30

Drowning, therefore, appears to have caused at least half the mortality, assuming the total loss to have been somewhere near 30 per cent. The total may, in fact, have been somewhat higher, but there seems to be no definite foundation for the impression sometimes expressed that an overwhelming majority of all the deaths were attributable to the above cause. In general terms it may be accepted as certain that there has been a tendency since Lissa and the Yalu for drowning to assume a position of greater *actual* but less *relative* magnitude, due to the increased loss of life from gunfire. The exceptions to this statement, which occurred in the Spanish-American War,

¹ The Battle of Tsushima, Semenoff, V., Captain, Russian navy, translated by Lindsay.

were due to special circumstances resulting from the availability of land, which, in some respects, removes the two principle naval engagements from the category of battles *at sea*.

The questions which now present themselves relate to the probability of such extensive losses occurring in future wars and the adoption of methods for their amelioration. It must be admitted that from a humanitarian standpoint the outlook is far from promising. However much naval conditions may change in the ultimate course of time, every great fleet action of the immediate future seems bound to include for the defeated side a certain sequence of events: A few ships may escape, a larger number will be destroyed during the earlier phases of battle, while for the rest, deprived of power for defense or mobility, reduced, in fact, to veritable charnel pits afloat, the alternatives must be surrender or destruction by torpedo attack. It would seem, then, that the only profitable point for discussion concerns the relative number of ships likely to fall within the second class indicated above, i. e., those which sink early in action.

There are some grounds for believing that the number of such disasters is not at present tending to increase. We may practically dismiss the ram as a weapon of offense, since opportunities for its use are now altogether remote and a repetition of the *Re d'Italia's* fate is most unlikely. The gun, on the other hand, has unquestionably far outstripped the development of armor, and the destructive effect of naval ordnance, as exemplified in the all-big-gun ship, is relatively much greater to-day than at the Yalu or even Tsushima. But most of its damage is above the water line. Immensely destructive to personnel, no doubt, but not necessarily to the immediate life of the ship under fire. Even with 12-inch shells or larger it will take a great many underwater hits to sink a big ship, properly subdivided, and such hits must always form an exceedingly small percentage of the whole.

Conditions with respect to mines and torpedoes are somewhat different. Undoubtedly one of the most interesting and surprising medico-military features of the last war was the great loss of life directly due to floating mines. The results of torpedo attack were, on the contrary, less destructive to life than might have been anticipated; the Japanese, in spite of dash and gallantry, made a very small percentage of hits, and it took a remarkable number of successful shots to sink or even completely disable a large ship. However, we must assume that with the development of these weapons themselves and utilization of the coming submarine of greater habitability and cruising radius, damage from these sources will inevitably increase, and as the injuries so inflicted, unlike those of the gun, affect primarily the flotation of vessels, they may very directly influence the loss by drowning.

On the whole, then, the power of offense tends so enormously to increase that it seems certain that ships will be *put out of action* more promptly than heretofore, but whether or not they will sink more rapidly, is another question. At this point *size* is likely to be the determining factor, for with increased displacement there comes not only actual but *relative* increase in resistance, especially against sinking. Further discussion along these lines; however, would involve technical difficulties quite beyond the scope of this paper.

Before leaving the subject of mines and torpedoes it may be noted that loss of life by these weapons would not have exactly the same crippling effect upon the service generally as an *equal number* of deaths directly due to gunshot, since the latter are particularly limited to men in a special class, viz, those above decks, the engineer's force being practically exempt. Torpedo or mine explosion, if followed by any loss of life whatever, is likely to include nearly the whole crew, and the damage is thus more generally distributed. *So far as it goes*—and the point is somewhat academic—this tends to make the gun more humane than the torpedo or mine, since with a given loss of life it inflicts more damage on the enemy; obviously it would be easier to replace a whole ship's company than to fill a thousand vacancies among officers and guns' crews alone.

Measures designed to prevent loss by drowning include those provided by the ship herself and relief afforded by other vessels. Little is to be expected from the former source. If wooden boats are brought into action they will not only be useless when needed, but a source of danger from fire and splinters beforehand. The Japanese left most of their boats behind; the Russians generally kept theirs on board. It is not surprising, therefore, that Semenoff refers to a blazing heap of wood where 11 boats had been piled up amidships; they had been filled with water before the action, but this soon leaked out through shot holes and there was not one available to take the wounded admiral off his ship.

Metal boats are exempt from fire, but hoisted on deck they merely serve to explode shells which might otherwise have caused no damage. It has been suggested that they be stowed on the gun deck behind armor,¹ but this certainly seems impracticable in numbers.

Individual apparatus—"life preservers" in some form—should be incombustible and incapable of exploding shell or causing splinters, a combination which does not appear to exist. In sufficient numbers they would also encumber the decks. The Russians used cork mattresses for this purpose and with considerable success; particularly in saving the lives of men wounded and helpless, some of whom were floating about for hours before being rescued. "Canvas bands were

¹ Commander William Hovgaard, Royal Danish Navy: *The Fate of the Russian Ships at Tsushima*; Jayne's Fighting Ships. 1906.

sewn on these mattresses in such a manner that a man can slip one of them on and be in possession of an excellent life preserver."¹ Since mattresses must be carried on board ship anyway, this procedure seems worthy of development, particularly if some method of rendering the materials fireproof can be successfully employed. On the Russian ships they must have added materially to the conflagrations on board, as there are several references to burning hammocks and mattresses.

Turning to outside assistance we may first consider the hospital ship, but difficulties at once appear, both in practical application and under the provisions of international law. In the past they have not been conspicuous upon such occasions. At Tsushima the Russians had two of these vessels, the *Orel* and *Kostroma*. The former, an 8,000-ton ship, was fitted out and maintained by the women of France and Russia; each defrayed half the total expense. The *Kostroma*, of 7,000 tons, was bought from the North-German Lloyd Steamship Co. and transformed into a hospital ship at Shanghai. (Spear.) Before the battle one or both appear to have taken position far in the van, where they certainly had no business to be. Later, during the approach and earlier phase of the action, they were near the rear and some 1,000 yards to starboard of the main column. During the entire afternoon of the 27th they seem to have hung on desperately to the rear of the transports, the safety of which was a constant source of embarrassment to the Russians, most of them being sunk. The hospital ships, therefore, were distinctly within the immediate area of operations. Eventually both were seized by the Japanese, and if they fulfilled any useful purpose in the meantime I can find no mention of the fact. The *Kostroma* was soon released and proceeded to Vladivostok, but the case of the *Orel* came before the prize court of Sasebo and she was condemned as good prize on four counts, one of which was that, as above noted, she had navigated at the head of the column "in the position usually occupied by reconnoitering ships."²

As for the Japanese, "their hospital ships *Saiko Maru* and *Kobe Maru* were on the Korean coast and did not arrive in time to take an active part in the battle." (Braisted.) As they were well aware long beforehand that a battle was impending this seems to have been in accordance with a predetermined policy not to have such ships within the combatant area, a policy based, in part, perhaps, upon questions of neutrality.³

¹ Spear, R., Surgeon, United States Navy: Report to the Surgeon General, United States Navy. 1906.

² See A. Pearce Higgins: Hospital Ships and the Carriage of Passengers and Crews of Destroyed Prizes. Law Quarterly Review. Oct., 1910.

³ See Pleadwell, F. L., Surgeon, United States Navy: The Tenth Convention of the Second Hague Conference of 1907 and its Relation to the Evacuation of the Wounded in Naval Warfare. War College lecture, 1910. Nav. Med. Bull., Oct., 1911-Jan., 1912. The whole question of the utilization of hospital ships during and after battle is here elaborately and most ably discussed.

Upon at least one other important occasion a so-called "hospital ship," or at least a vessel more or less set aside for hospital purposes, was within reach during a naval battle, and this was as far back as Lissa.¹ She remained with Admiral Albini's division, taking no part in the day's proceedings, though she seems to have received the wounded from a landing force previously sent ashore. It is of interest to note that she mounted two guns, which was of course entirely permissible, as such vessels were not then neutralized. Her presence at Lissa is worthy of note, because, as has often been stated, the "needless loss of life by drowning" which occurred during this engagement was largely responsible for the public agitation in favor of applying to naval warfare the immunities which had already, in 1864, been adopted for hospital service on land. Without in any degree minimizing the exceeding importance of these humanitarian rules (which finally became operative at The Hague in 1899), it may be suggested that their application upon this particular occasion would have made no material difference whatever. The *Italia* sank in the thick of the fight where no immediate rescue was possible, while the captain and crew of the *Palestro* gallantly refused to leave their ship, though there was ample opportunity to do so.

Past experience with hospital ships in battle is thus altogether negative, but there are certain well-defined principles which, in the main, will guide their action. For a discussion of these questions in full, Surg. Pleadwell's paper must be referred to, but certain points may be touched upon in this connection. Regarding the position of the ship, all will agree with Surg. Gen. Stokes in saying that "it is certain that it would be folly to sacrifice it by placing it within flag-signal distance; in fact, anywhere within the danger zone."² When we consider how very extensive this "danger zone" may be, even before there is general dispersion of the ships and squadrons, it will be seen that this is a serious restriction. The area embraced by the guns of a modern fleet is hard to realize; 48 armored ships, in column, without necessary scouts, destroyers, and auxiliaries, could actually sweep at least 500 square miles, and it is safe to assume that with two such fleets dispersed, in action, the "danger zone" will greatly exceed ten times this area. There are, nevertheless, certain circumstances which might readily arise, as the Surgeon General has elsewhere shown,³ under which the services of a hospital ship might be utilized to save a crew from drowning, providing communication could be effected under battle conditions up to some 10 or 12 miles. The case of the

¹ See Willson, op. cit. Of course, there are earlier examples, such as those in our Civil War. Most of these, however, operated with the Army.

² See Surg. Charles F. Stokes, United States Navy: *The Hospital Ship as an Aid to Fleet Efficiency*. The Military Surgeon, January, 1910.

³ "Naval Surgery" in *American Practice of Surgery*, 1911.

Suvaroff may serve as an illustration. For some time before she sank this vessel was almost completely *hors de combat*, on fire, desperately battered, and at times more or less isolated. It is certainly conceivable that, with the shifting scene of battle, a hospital ship—let us say the *Kostroma*—could have approached and taken off the remainder of her crew, all of whom were actually drowned because the ship herself could not be located. Suppose, however, the *Kostroma* has made such an attempt, questions relating to her neutrality, which are of great practical importance, at once suggest themselves. To be clearly within her neutral rights it must appear that she is not being used “for any military purpose,” that she “in no wise hampers the movements of the combatants,” and she must act at her “own risk and peril.” If under these conditions she picks up men actually struggling in the water, the case is plain enough. The Russian program for the First Hague Conference specifically invited action looking to the “neutralization of ships and boats employed in saving drowning sailors *during* or after naval battles,” and the phraseology actually adopted—and still in force—states that hospital ships “shall afford relief and assistance to the sick, wounded, and *shipwrecked*.” (Italics are mine.) But at 6 p. m., for example, were the uninjured members of the *Suvaroff*’s crew shipwrecked (*naufragés* in the original text; the translation has caused some confusion but it is made clear in the general report)? Prof. Hull defines this term as embracing “those who have been placed in danger of drowning as a result of a naval combat,” and certainly no more accurate definition could be given regarding the plight of the *Suvaroff*’s survivors at the time specified above. In any particular case it would therefore seem that the point to be determined is not so much one of principle as one of fact. Was or was not the ship actually *hors de combat* and sinking? If there were any doubt upon this point, the case would probably come before a prize court for decision, but to me it seems quite unnecessary to take the ground, apparently advocated in some quarters, that we must stand idly by until a ship has sunk, struck her colors, or “the battle is over”—a point difficult to determine. According to Admiral Togo, Tsushima was *won* in less than 40 minutes, but for some ships the real fighting had not then begun and was not *over* until the next day.

To continue with our hypothetical case of the *Suvaroff*’s crew, now safely transferred to the *Kostroma*. What, let us ask, may be done with them? Sick or wounded men may be retained on a hospital ship until cured—subject, of course, to capture by the enemy—and may then serve again in arms. There is no time limit whatever on their detention except that due to their own physical disability. The men on the *Kostroma*—some or all—are “fit for duty.” Can she

accordingly during the night discharge these "patients" to the *Ouchakoff* to fill up vacancies for her fight the next day? In such an extreme case the verdict of a prize court would doubtless be "no," as it would certainly be using the hospital ship for a very important and direct "military purpose." It is important to note that such cases are by no means improbable and that they may be on the border line where, in the absence of precedents, no hard and fast rule seems applicable. So far as I am aware this particular source of possible embarrassment has not been the subject of legal discussion.

Without going into further details regarding the function of hospital ships in action we may safely assume that although upon occasion they may reach a ship which has fallen out of the line and so succeed in rescuing her crew, such opportunities must always be looked upon as too exceptional to answer the problem of drowning.

I therefore wish to invite particular attention to certain supplementary measures suggested to me by some observations made a few years ago in a paper by Admiral Sir Nathaniel Bowden-Smith, K. C. B.¹ He expresses the opinion that with each squadron of six battleships there should be one hospital ship and an accompanying *sea-going, tender*. The latter—two to each fleet—are, in action assigned to positions only one mile astern of the rear vessel in column, the hospital ships themselves being some miles farther away. The writer did not indicate the structural features of these tenders or his views as to their particular utility, but it would certainly seem that small converted yachts, such as those purchased for our Navy during the Spanish War would be admirably adapted to carry out the special work now under discussion. These small craft would require no elaborate medical equipment, and would carry only a small personnel; they should be neutralized, like their parent ship, and their special mission in battle should be to render assistance to crews "placed in danger of drowning." They should, of course, carry "wireless," have as high speed as practicable, and, in addition to life boats should be equipped with special life-saving apparatus designed for taking men rapidly on board *directly from the water*, such as two or more booms on each side, rigged with numerous ladders and foot ropes. To this end the vessels must not be too large or their freeboard too high; they must be easily handled, capable of going alongside a battleship if necessary or proceeding directly within the midst of a crew struggling in the water. Vessels of this type could be expected to take some risks; they must not, of course, embarrass the actions of either belligerent or invite inevitable destruction by wilful exposure to direct gunfire, but they need not be guarded with that assiduity which prevents the hospital

¹ The Organization of a Modern Fleet for War. Jour. Roy. United Service Inst., December, 1906.

ship, except on rare occasions, from rendering aid where it is often most imperatively demanded. If the hospital tender came by chance or necessity temporarily within the danger zone her small size would minimize the likelihood of a disastrous hit.

One obvious objection to the employment of such vessels may be based on their small carrying capacity. While I have no positive data available this question could readily be settled by direct experiment and the necessary displacement determined accordingly. I am convinced that the size should be kept at the minimum and that two vessels, say, of 500 tons each would prove much more useful than one double this displacement. Taking the *Hist*, 475 tons, as a type it seems probable that some 500 men could in fair weather be crowded on board and retained simply long enough to reach the hospital ship, perhaps 10 or 15 miles away. This is far from the full complement of a battleship, it is true, but it must be remembered that the tender will not be dealing with full complements. Even this number could only be taken off a sinking ship under the most favorable circumstances with plenty of time available. For example, the ship may be on fire, so that the tender can not approach on the lee side, conditions which actually existed when Admiral Rodjestvensky left the *Souvaroff*. If the ship has already sunk it is quite improbable that anywhere near 500 survivors will still be afloat when the hospital tender arrives on the scene, even if her approach requires but a few minutes. On the whole, I would tentatively suggest 900 tons as a *maximum* displacement. That such small vessels can do excellent work along these lines has been already demonstrated by the successful utilization of *destroyers* for just this purpose. But in general their cooperation is not to be counted upon; theirs is a different mission and they may not be diverted to secondary aims.

Finally, if vessels of the type herein proposed prove actually capable of successful accomplishment in a humanitarian field now so barren of results, I would suggest that they should especially commend themselves to the Red Cross and other charitable associations by reason of their availability and small comparative cost.

In closing this paper the following conclusions are submitted:

1. Drowning in naval warfare causes loss of life substantially equivalent to that due to gunfire or may even exceed it.
2. Unless special means of relief are adopted there is no immediate prospect that such losses will materially decrease.
3. This loss of life is not usually necessary for military ends.
4. Life-saving devices on vessels of war must at present continue to be totally inadequate.
5. That it is desirable to investigate the possibilities of hospital tenders or such other methods as give promise of practical utility.

ETIOLOGY OF GANGOSA, BASED UPON COMPLEMENT FIXATION.

By Asst. Surg. E. P. HALTON, United States Navy.

Gangosa has been extremely common in Guam for over 100 years, but was first brought to the attention of the medical world in 1828 by the report of a Spanish commission appointed to investigate it throughout the Ladrone or Marianne Islands, of which group Guam is the southernmost and largest member. By this commission the disease was given the name "gangosa," signifying "nasal voice," this being supplanted recently by the Latin term "rhino-pharyngitis mutilans," based upon the clinical manifestations of the ulcerative process in the nasopharynx.

Although gangosa is not limited to Guam, the first scientific studies on the disease were made there during the years 1905 to 1907 by Leys, Mink, and McLean, United States naval surgeons attached to the naval station on that island. By these observers it was considered that gangosa is a distinct pathological entity and limited to the mouth, nose, and pharynx.

Subsequent medical officers on duty in Guam included under this term those cases presenting more or less extensive chronic ulcerative processes of the bones and tissues elsewhere, basing their opinions upon the frequent association of these lesions with those of the nasopharyngeal region. In addition they came to believe that a remote syphilitic infection may have been the etiological factor, since treatment with mercury and potassium iodide has succeeded marvelously well, improving or curing the most obstinate cases. Another basis for this belief in the syphilitic etiology of gangosa is the fact that primary and secondary syphilis are unknown amongst the native population. These observers reasoned that syphilis had been introduced, perhaps centuries ago, by whalers who made Guam their southern rendezvous, and that the whole native race was rendered practically immune to a fresh syphilitic infection by transmission of this disease through generations of syphilitic ancestors. Hence gangosa was accounted a tertiary lesion of syphilis.

On the other hand, it has been suggested that yaws may have been the primary cause of gangosa, but no facts have been adduced in support of this view.

In Guam at present there are 324 patients classified as gangosa cases, 108 with lesions of the nose, throat, and palate only, 125 showing healed ulcers with more or less deformity due to contraction, and 99 who show lesions of both types. Practically all of these cases have been receiving mixed treatment since July, 1910, the average daily dose being one-sixth grain of mercuric chloride and 30 grains of potassium iodide. As a result of this treatment there are extremely few open lesions among the gangosa patients.

In view of the etiological question as to the origin of gangosa it was thought that a study of the serological reactions would prove instructive.

The method used in determining the serum reactions has been that recommended by Noguchi in his *Serum Diagnosis of Syphilis* (second edition). Fresh, active patients' serum has been employed, together with acetone-insoluble lipoids as antigen. The hemolytic system has been composed of antihuman rabbits' serum as amboceptor, 40 per cent dilution of guinea pigs' serum as complement, and a 1 per cent suspension of washed human red cells. Positive and negative controls have been made in all cases, together with frequent controls upon the antigen, amboceptor, and complement.

To further verify the results obtained 30 patients were tested a second or third time and always with constant results, except one weakly positive reading, which subsequently became strongly positive.

The only troublesome factor has been the guinea pigs' serum used as complement, since it retains activity in this climate less than 24 hours, necessitating fresh serum daily.

In interpreting the results none but a complete inhibition of hemolysis has been considered positive, weakly positive readings not being included in this report.

The results of the tests made are presented below, a tentative division having been made according to the clinical form of the disease:

GANGOSA.

1. Cases with lesions of nasopharynx only: Number examined, 89; number positive, 33; percentage positive, 37.
2. Cases showing lesions elsewhere only: Number examined, 109; number positive, 47; percentage positive, 43.1.
3. Cases with lesions of mixed type: Number examined, 83; number positive, 25; percentage positive, 30.
4. Total number examined, 281; number positive, 105; percentage positive, 37.3.

In this table it will be seen that there is no essential difference in the reactions of any form of the disease, and, so far as complement fixation power is an indicator, all may be assumed to be different forms of the same disease.

Although there is a high percentage of positive readings given above it is extremely probable that there was an even higher proportion previous to the prolonged course of mixed treatment given these patients.

Together with the gangosa patients the sera of all other patients accessible were examined, including cases of yaws and leprosy, and are herewith presented:

1. Yaws present at time of test: Number of cases, 11; number positive, 11.
2. History of yaws one year to many years before: Number of cases, 24; number positive, 11.

3. Leprosy (yaws not eliminated): Number of cases, 24; number positive, 11.

4. Other diseases: (a) Natives—Number of cases, 36; number positive, 3 (mothers of 2 of these have gangosa). (b) Whites—Number of cases, 22; number positive, 1 (secondary syphilis).

It appears from this that yaws gives an exceedingly high percentage of positive results, perhaps being responsible for the positive readings obtained amongst the lepers, since it is impossible to exclude it.

Yaws has long been endemic in the island and is known to the natives under the name "duya." It is characterized by an initial lesion, the "sainan-duya" or "mother-yaw," as it is called, and a rather mild secondary eruption. It is not common among the better class of natives nor in the more hygienic villages, but is rife among those natives least devoted to cleanliness, and it is among these that gangosa is most prevalent.

As yet the treponema pertenue has not been found in the cases treated, since only infected lesions of the secondary stage have been observed. Patients with primary or early secondary lesions do not present themselves for treatment, preferring to use a method of their own, consisting of iron rust and lemon juice applied locally.

Judging by serum reaction, then, it is seen that yaws as well as syphilis may be culpable in causing gangosa. Careful questioning of the gangosa patients will, in the majority of cases, elicit the admission that they had yaws at some period, and, in fact, some of them blame their present condition upon yaws, the native name for the extensive, deforming ulcerations of the limbs meaning "severe yaws."

In favor of yaws as the etiological factor is the fact that it is ever present among the natives, that the majority of the gangosa patients acknowledge having contracted yaws, and, negatively in its favor, that among these presumed syphilitic people there are no other syphilitic manifestations, such as insanity, spinal-cord disease, iritis, keratitis, and Hutchinson's teeth, while female gangosa patients usually bear healthy, full-term infants, miscarriage being rare. Finally, post-mortem examinations upon gangosa patients have not shown any gummatous lesions of the internal organs.

It is well known that potassium iodide and atoxyl, as well as the newer arsenical, salvarsan, are often curative in yaws, so that the improvement of the gangosa cases under potassium iodide would argue as strongly for yaws as for syphilis. Four cases which were treated by the intravenous route with salvarsan further illustrate the parallel between the two forms of the disease.

All were comparatively new cases, and all save one had been under mixed treatment for several months without beneficial results. While under treatment with salvarsan all other medication was

stopped, but mixed treatment was resumed upon healing of the lesions.

The Noguchi test was positive both before and after the treatment and is still positive in all.

It is regretted that a larger series of cases can not be presented, but suitable cases are rare. The cases are briefly presented in chronological order:

Case 1.—A native youth of 21 who presented an extensive, foul ulceration of the soft tissues of the palate, pharynx, and nose. He received 0.6 gm. of salvarsan on June 25, 1911, and within three days the ulceration was clean, showing healthy granulations at the edges. Three weeks later the whole lesion had healed without involving the bones to any extent, although the soft palate, tonsils, fauces, and uvula were lost.

Case 2.—A native girl of 16, who had not reported for treatment until the process had progressed to a complete loss of the nasal septum and soft palate. When first seen the pharynx had healed, but there was a chronic ulcer involving the floor of the nose and the upper lip. Foul pus was freely discharging and the ulcer seemed to be extending rapidly.

She was given 0.3 gm. of salvarsan on July 19, 1911. Two days later the ulcer had become dry and covered with a crust, and within 10 days had diminished in size by one-half. A second injection of salvarsan, gm. 0.4, was given on August 2, 1911, the first dose having been insufficient. Within a week the ulceration had completely healed, and she was discharged on August 17.

Case 3.—A native woman of 23, who showed an acute ulceration of the posterior pharyngeal wall and absorption of the nasal septum. On July 29, 1911, she received 0.5 gm. of salvarsan, and two weeks later there was no sign of ulceration visible, so that she was discharged from hospital treatment on August 17, 1911.

Case 4.—A native woman of 23, who showed four deep chronic ulcers at the base of the neck, each as large as a silver dollar, but no lesion in the nose or throat. Three of these ulcers were situated over the right clavicle, which was enlarged in its inner two-thirds to three times its natural size.

The patient was given 0.2 gm. of salvarsan on September 15, 1911, a fault of technique being responsible for the small dose. By the first of October every ulcer had healed completely and the clavicle markedly diminished in size.

This case was considered one of tertiary yaws and is interesting in that it showed the rapid cure following a small dose of salvarsan, although the lesions had resisted and extended rapidly under potassium iodide and local dressings. Also in that it showed the same response to treatment as did the pure nasopharyngeal cases above.

Considering the facts stated herein, it seems a rational conclusion that gangosa or rhino-pharyngitis mutilans as present in Guam at this time is a tertiary lesion or sequel of yaws or of yaws acting in conjunction with some other undetermined factor.

FURTHER OBSERVATIONS ON THE INSANE OF THE NAVY.

By Passed Asst. Surg. HEBER BUTTS, United States Navy.

The report which follows is supplemental to the article on "Insanity in the Navy," which appeared in the United States Naval Medical Bulletin of October, 1910. That report covered the admissions of

insane men of the Navy and Marine Corps into the Government Hospital for the Insane for the period January 1, 1899, to June 1, 1910. The present report deals with 146 insane men of the Navy and Marine Corps who have been admitted into the hospital in the 19 months beginning June 1, 1910, and ending December 31, 1911. Of this number 3 have been retired officers of the Navy, and 2 have been seamen of the Naval Auxiliary Service. There remain to be discussed 141 cases of insanity from the active lists of the services during the 19 months covered by this report which have upon one or more occasions been admitted to the hospital.

Table No. 1.

	Number.	Per cent.
Recovered.....	32	22.69
Improved.....	8	5.68
Unimproved.....	1	.71
Died.....	6	4.26
Not insane.....	32	22.69
Remaining.....	62	43.97
Total.....	141	100.00

The conspicuous feature of Table No. 1 is the very large number of men who have been discharged from the Government Hospital for the Insane as "not insane," they having manifested no evidence of insanity after their admission into that institution. The number discharged as "not insane," 32, just equals the number discharged as "recovered" from various psychoses. This is explained in several ways: In the first place, a large percentage of those discharged as "not insane" were evidently convalescing from some temporary mental disturbance at the time of their admission to the hospital, and there was nothing left for the observation of the hospital physicians but the residuals of what were perhaps one-time psychoses. These "residuals," as I choose to call them for the want of a better name, consisted for the most part of such ill-defined mental phenomena as slight emotional indifference, lack of interest in passing events, no ambition, or simple laziness. While it is admitted that these "residuals" are often both the precursors and the symptoms common to many psychoses, one would hardly be justified in making a diagnosis of insanity on these symptoms alone, so there is nothing left for the hospital authorities to do but to discharge such patients as "not insane" after a reasonable period of observation of, say, two or three months, and perhaps guess what may have been the matter with them prior to admission to the hospital. In two or three instances it was plainly apparent that the men discharged as "not insane" were at the time of their admission well advanced in

convalescence from a protracted alcoholic debauch. Others, while not insane in a medical sense, and probably not in a legal sense, were characterological anomalies who could and would easily be self-supporting if left to themselves, though they were quite unfit for the naval service. To be more explicit, a short synopsis of a few of these so-called characterological anomalies is here given.

Case A.—A rather ignorant colored mess attendant, United States Navy, "got religion" a short time before he enlisted in the Navy, and imagined he was "called" by God to preach or "exhort about salvation" to all men. With a zeal worthy of better results, he continually usurped the chaplain's vocation aboard ship, and "exhorted" on every possible occasion with the ostensible object of inducing his shipmates to "turn from the error of their ways and accept the true religion." Confinement in the brig only served to intensify his zeal, and he sang and "exhorted" by turns, resolved to "endure to the end." Within six months after enlistment he was transferred to the Government Hospital for the Insane with a diagnosis of "dementia." At the hospital he was a model patient in every way, manifested no evidence of insanity, and after three months' observation was discharged as "not insane." He had "a colored man's religion." Such a man is unfit for any practical service aboard ship, but if left to himself can be self-supporting. It is useless to attempt to discipline such a man, as he is dominated by the one idea that he is "called to preach," and like many another oftentimes more intelligent religious fanatic, he would probably suffer great torture, perhaps death, rather than obey orders and confine his activities to the legitimate work of his rating, mess attendant.

Case B.—Private, United States Marine Corps, was admitted to the hospital with a diagnosis of "dementia." So far as I could learn from questioning him and his health record, he was both a hobo and a somnambulist. He had wandered and beaten his way from New York to California, later to Panama and Cuba, always in search of "some kind of excitement." In Cuba he became infected with malaria, and enlisted in the Marine Corps, "in order to receive medical treatment." His somnambulist tendencies soon became apparent, and during one of them he engaged in a shooting affray with a sentinel on guard, during which both of them were shot, but not mortally wounded. After a reasonable period of observation at the Government Hospital for the Insane, during which he was a model patient, he was discharged as "not insane." He was a splendid type of physical manhood but both an unreliable and dangerous man to be intrusted with firearms or other weapons, therefore unfit for service.

Case C.—Seaman, United States Navy, was admitted to the hospital with a diagnosis of manic-depressive insanity. He was a sexual pervert who began homosexual practices at 16 years of age. He possessed multiple stigmata of degeneracy, had failed twice to keep up with his classes in public school prior to enlistment, and gave a history of occasional alcoholic excesses. He voluntarily asked for his discharge from the service so that he might pursue his abnormal practices in secret. After five weeks' observation at the hospital he was discharged as "not insane."

Case D.—Musician, United States Navy, was admitted to the hospital with a diagnosis of manic-depressive insanity. He had had quite an unstable occupational career prior to enlistment, frequently punctuated by periods of idleness, vagrancy, and alcoholic excesses. He had had syphilis and gonorrhea, and was an inveterate cigarette smoker. He enlisted in the Navy merely because he "was hungry and could not find anything else to do." At the time of admission he presented no evidence of insanity, and so far as could be learned from his own quite frank statements and his health record he had suffered prior to his admission to the hospital from a temporary

mental disturbance as the result of a prolonged alcoholic debauch. He was discharged as "not insane."

Case E.—Apprentice seaman, United States Navy, was admitted to the hospital with a diagnosis of "dementia," after he had had about 18 months' service in the Navy. He had the appearance of a chronic alcoholic and gave a long history of alcoholic excesses and hobo life. His mother died of cancer of the breast, and his father, a chronic alcoholic and professional gambler, was killed at a card game. Within five or six months he had spent an inheritance of about \$7,000 from his father in drunkenness and dissipation, after which, at the suggestion of a friend (?), he enlisted in the Navy. He was discharged as "not insane" after a reasonable period of observation, during which he manifested no symptoms of insanity.

Case F.—Private, United States Marine Corps, was admitted to the sick list and later to the hospital with a diagnosis of "dementia" after he had had about one year's service in the Marine Corps. He was a Jewish stock-market "plunger," who, prior to enlistment, had lost all his money, and to a degree shattered his congenital unstable nervous organization by speculating in cotton and worthless oil-well stock. His life had been an almost unbroken career of failures, and he gave a history of frequent sexual and alcoholic excesses. Aside from a slight degree of mental depression, which might easily be accounted for by his failure to succeed in life, he manifested no evidence of insanity at the hospital and was discharged as "not insane" after a reasonable period of observation.

It will readily be seen from the very brief synopses of the half dozen histories above narrated that, even though they could not be considered insane, not one of them could be considered fit for the service on account of the habits of their past life or their peculiarities of character. It is only fair to state, however, that of the 32 men who have been discharged as "not insane," 2 have thus far been readmitted to the hospital and are now indeed insane. One of these readmitted patients was an alcoholic habitu , whose mental symptoms had all disappeared by the time he had first been admitted to the hospital. While there he had no opportunity to indulge his appetite for alcoholic liquors. At the time of his discharge from the hospital as "not insane" he also received his discharge from the Navy and four or five months' accrued pay. All restraint from both the hospital and the naval service thus being removed, he soon entered upon a prolonged alcoholic debauch. Pronounced symptoms of a psychosis quickly reasserted themselves, and, after an unsuccessful attempt at amputation of his testicles, he was readmitted to the hospital.

The second readmitted patient who had been discharged as "not insane" after nearly two months' observation, during which he manifested no evidence of insanity, had in the service been originally diagnosed "mania," and later "dementia." He had had 12 years' service in the Navy, and gave a history of syphilis when he was 16 years old. The Wasserman reaction with his blood serum was positive for syphilis. Within a short time after his discharge from the hospital and return home, his father noticed certain peculiarities

of conduct on the part of his son which he had never noticed before. His manners at table were not as good as they had formerly been; he did not wait for his mother to say "grace" before commencing to eat as he had formerly done; he made embarrassing, and at times, quite indecent remarks to his father's feminine guests; he developed various other little eccentricities, and would frequently use coarse and profane language, something he had not done before. One day he suddenly announced that he was going to marry an old school-day sweetheart. His father suspecting that he was not "right" mentally, carefully destroyed his son's obscene letters to his sweetheart. Gradually the son's abnormal conduct became more and more pronounced, and six weeks after his discharge as "not insane" he was readmitted to the Government Hospital for the Insane, a very much excited case of general paresis. During his former admission his mental disease had been in a remission, and his symptoms were in abeyance. Incidentally, this case illustrates in some degree not only the great importance, but also the extreme difficulty of an early diagnosis of general paresis. The early manifestations of this incurable disease, the victims of which are yearly becoming more and more numerous, are often so insidious and so protean in character that it is often far advanced before anyone suspects that a most grave mental disease is wholly responsible for certain irregularities of conduct which surprise, shock, and humiliate friends and relatives. Even when such a case is early recognized and confined in an institution for the insane, it is often a matter of great difficulty to convince friends and relatives that the patient is afflicted with a terrible mental disease which, like an avenging Nemesis or a giant octopus will, slowly but surely, seize upon and cloud each mental function one by one, until his personality will be so changed and his dementia so profound that he may not even know his own name. Seldom does either the patient or his friends have any real insight into his true condition. With a characteristic drawl the patient says he is "all right," and for a time his friends and relatives see in him only a robust, well-nourished, often ruddy-faced man. They may be willing to admit that he has a slight speech defect, and perhaps a slightly unsteady gait, or a tremulous hand, but they can see nothing else, and are unwilling to take the word of competent alienists that such a man is most mentally sick. Several naval patients of this kind have been removed from the hospital by skeptical, over-solicitous friends or relatives, only to be returned a short time later in much worse condition than when they left. Patients of this class are capable of almost any crime, contracting debts, or squandering the savings of years. I have in mind one such naval patient who, had he been permitted to carry out one of his insane projects, would have blown

up a vessel of the Navy with all on board. Such patients should always be confined in institutions for the insane, and a guardian should have complete charge of their financial affairs.

TABLE No. 2.

Age.	Number.	Per cent.
Under 20.....	14	9.93
Between 20 and 30.....	89	63.12
Between 30 and 40.....	33	23.40
Over 40.....	5	3.55
Total.....	141	100.00

Table No. 2 shows a somewhat higher percentage of insanity occurring in men of the Navy under the age of 30 years than was shown in a similar table covering a much greater period of time and a larger number of men in my former article on "Insanity in the Navy," referred to above. This may be because a larger percentage of men under the age of 30 years is being enlisted now than formerly.

TABLE No. 3.

Nativity.	Number.	Per cent.
United States.....	125	88.65
Germany.....	4	2.84
Ireland.....	3	2.13
Philippine Islands.....	2	1.42
Other countries.....	7	4.96
Total.....	141	100.00

When Table No. 3 is compared with the somewhat similar table in my former article, it is seen that the percentage of insanity among native-born men in the service has apparently increased slightly more than 10 per cent, while the percentage of insanity among the foreign born has decreased in about the same ratio. This is doubtless because, as stated in the annual report of the Chief of the Bureau of Navigation for the fiscal year 1911, "in the total force there has again been a slight decrease in the number of aliens in the service." In that report it is stated that 89.79 per cent of the total enlisted force (47,612) are native-born men, 6.41 per cent are naturalized, making a total of 96.20 per cent of the enlisted men who are citizens of the United States, and only 3.80 per cent of them who are foreign born.

Incidentally, it may be stated that seven enlisted negroes and two Filipinos were admitted to the hospital during the 19 months covered by this report. They are included in the 141 total admissions from the active lists.

TABLE No. 4.

Rank or rate.	Number.	Per cent.	Rank or rate.	Number.	Per cent.
Commissioned officers, United States Navy.....	2	1.42	Enlisted men—Continued.		
Warrant officers.....	2	1.42	Ship's cook.....	3	2.13
Enlisted men:			Ship's fitter.....	1	.71
Machinist's mate.....	4	2.84	Electrician.....	2	1.42
Boatswain's mate.....	3	2.13	Water tender.....	1	.71
Carpenter's mate.....	2	1.42	Landsman.....	1	.71
Sailmaker's mate.....	1	.71	Musician.....	2	1.41
Apprentice seaman.....	14	9.93	Hospital apprentice.....	1	.71
Ordinary seaman.....	12	8.51	Commissary steward.....	1	.71
Seaman.....	11	7.80	United States Marine Corps:		
Coal passer.....	23	16.31	Commissioned officers.....	1	.71
Fireman.....	8	5.67	Sergeant.....	1	.71
Master-at-arms.....	7	4.96	Corporal.....	1	.71
Mess attendant.....	6	4.25	Private.....	23	16.31
Oiler.....	4	2.84			
Chief yeoman.....	4	2.84	Total.....	141	100.00

Table No. 4 is chiefly interesting because it shows a considerably decreased percentage of insanity occurring among privates in the United States Marine Corps, when compared with the similar table in my former article on "Insanity in the Navy," wherein it was shown that the privates in the United States Marine Corps furnished 23.66 per cent of the insanity in the Navy considered with the United States Marine Corps as a whole. Now they apparently furnish but 16.31 per cent of the insanity in the two services considered as a whole. This may be due to a more careful selection of recruits for the United States Marine Corps than formerly. In this connection I wish to correct an erroneous statement contained in my former article to the effect that no commissioned officer of the United States Marine Corps had yet as a patient been admitted to the Government Hospital for the Insane. That statement was too broad; it should have been limited to the 10½ years covered by the report, for which it yet holds true. I find upon more carefully searching the records of the hospital that a colonel of that service spent somewhat less than two months in the institution in 1892, and was discharged "unimproved" into the care of his friends. I also find that a retired captain of the United States Marine Corps died in the hospital in 1894, after spending less than a year there.

TABLE No. 5.

Naval diagnosis.	Number.	Per cent.	Naval diagnosis.	Number.	Per cent.
Dementia.....	55	39.01	Feeble-minded.....	1	0.71
Dementia præcox.....	24	17.02	Psychasthenia.....	4	2.83
Insanity.....	1	.71	Cerebral syphilis.....	3	2.14
Manic-depressive insanity.....	17	12.06	Monomania.....	1	.71
General paresis.....	9	6.38	Alcoholism.....	2	1.42
Mania.....	4	2.83	Mentis defectio.....	1	.71
Melancholia.....	14	9.93			
Paranoia.....	4	2.83	Total.....	141	100.00
Imbecility.....	1	.71			

Table No. 5 represents the diagnoses, as made by medical officers of the service, of mental disorders occurring in the naval service during the 19 months covered by this report. Several of these diagnoses are open to criticism, and are not to be found in Form K. For instance, "insanity" is no diagnosis for any specific mental disorder. "Mania" and "melancholia" are merely symptoms common to many psychoses. They are not disease entities. A patient suffering with general paresis, for instance, may be maniacal, or he may be melancholic, and the same is true of many other psychoses. In the same way "dementia" is a very general term, like the word "fever." There are almost as many varieties of "dementia" as there are kinds of fever, and to use the term "dementia" with no qualifying word is exactly analogous to stating that a patient has fever without specifying the variety of fever. It is of some importance for a medical officer, as regards prognosis and treatment, to know whether a patient has typhoid fever or malarial fever. The same is true of dementia. It is of some importance, as regards prognosis and treatment, to know whether a patient is suffering with dementia præcox, dementia paralytica, dementia epileptica, dementia senilis, dementia arteriosclerotica, dementia syphilitica, or dementia alcoholica, etc.

"Imbecility," "feeble-minded," and "mentis defectio" could easily be included under one caption of "imbecility" or "mentis defectio." Both are good terms for congenital mental weaklings. I believe "imbecility" or "mentis defectio" should have a place in the nomenclature of Form K. Of course medical officers are not supposed to enlist this class of individuals, but the fact remains that they do, as testified to by reports of medical survey and health records accompanying enlisted men to the Government Hospital for the Insane. Congenital mental defectives or imbeciles should not be diagnosed "dementia," and thus forced into a class of diseases to which they do not belong. "Dementia" is a more or less permanent acquired mental disease.

"Monomania" is no longer a descriptive term for a disease entity. So far as I am aware, the term is no longer used in any modern textbook on psychiatry. Contrary to a rather popular error, it may be said in passing that an individual can not be "insane on one subject and sane on all others." This erroneous conception once gave rise to the diagnosis of "monomania," but it has long since become obsolete. One insane delusion may be the only symptom apparent to the casual observer, but a more careful examination of the patient by competent individuals will always reveal other evidences of unsound mentality, emotional deterioration or deviations from the normal in speech and action.

TABLE No. 6.

Hospital diagnosis.	Number.	Per cent.	Hospital diagnosis.	Number.	Per cent.
Dementia præcox.....	66	46.81	Acute confusional insanity....	2	1.42
Symptomatic depression.....	1	.71	Undifferentiated mental depression.....	1	.71
Manic-depressive insanity.....	5	3.54	Alcoholic hallucinosis.....	1	.71
Dementia paralytica.....	15	10.64	Infection psychosis.....	1	.71
Cerebral syphilis.....	5	3.54	Post-traumatic psychopathic state.....	1	.71
Psychoneurosis.....	1	.71	Diagnoses not yet determined.	5	3.54
Not insane.....	29	20.57			
Traumatic psychosis.....	1	.71			
Prison psychosis.....	1	.71			
Imbecile.....	3	2.13			
Psychogenetic depression.....	3	2.13			
			Total.....	141	100.00

In Table No. 6 are shown the diagnoses given by the hospital physicians to the same cases enumerated in Table No. 5. Many of these revised diagnoses are also not to be found in Form K. From the table we learn that nearly 50 per cent of the insanity of the Navy is dementia præcox. This is not surprising when account is taken of the facts that the Navy is largely composed of young men under 30 years of age, and that dementia præcox is a mental disease essentially of the period of puberty and adolescence.

Many cases diagnosed manic-depressive insanity by naval medical officers are really cases of dementia præcox, so that instead of there being the 17 cases of manic-depressive insanity, as shown in Table No. 5, but 5 cases of the disease were found by the hospital authorities.

The large number of cases of dementia paralytica and cerebral syphilis will receive separate consideration in another part of this article.

An apparent inconsistency seems to exist between the statement in Table No. 1 that 32 were discharged as "not insane," and the statement in Table No. 6 that only 29 were so discharged from the hospital. This inconsistency is explained as follows: One "imbecile," one case of "undifferentiated mental depression," and one case diagnosed "post-traumatic psychopathic state" were really discharged as "not insane," as these three cases, together with 29 listed in Table No. 6 as "not insane," did not manifest sufficient evidence of actual mental disease during their stay at the hospital to warrant the hospital authorities in making diagnoses of more definite mental disorders. The same remark applies to the cases of "symptomatic depression," "psychoneurosis," "traumatic psychosis," "prison psychosis," and "psychogenetic depression." In this connection it may be stated that many mental disorders are not nearly so susceptible of exact diagnoses as many people suppose, and there are many cases of insanity, both in the Navy and out, for which no diagnosis in Form K would be suitable. To give these cases Form K diagnoses is both gratuitous and erroneous, though for statistical purposes and the making out of

monthly and quarterly returns, medical officers are obliged to do so. There are many individuals in every walk of life who, under certain inimical conditions, become quite as much mentally depressed as some of the cases of "insanity" in the Navy which are committed to the Government Hospital for the Insane with the diagnosis of "melancholia." These so-called cases of melancholia in the service have been caused in various ways: Some were apparently brought on by the receipt of bad news, a death of father or mother, by financial difficulties at home, love and other disappointments, nostalgia, and failure to succeed in life. These are not bona fide cases of "insanity," and they should not be committed to institutions for the insane, as they are usually quite temporary. With a change to almost any kind of different environment, varied occupation, good food, cheerful surroundings, and the well-known therapeutic influence of time, these mental wounds quickly heal, and often leave no scar. It is not to be denied that the majority, probably all, of these so-called cases of "melancholia" occur in distinctly psychopathic individuals, who have a strong predisposition to insanity, and doubtless would become truly insane if exposed for a sufficient length of time to adequate exciting causes. The same remark applies to many of the psychoneuroses, neurasthenias, psychasthenias, hysterias, epilepsies, and anxiety psychoses. These individuals are in very different classes from those who have entered the intellectual night of dementia. The latter should be confined in institutions for the insane. The former, though permanently unfit for the naval service, because of their unreliability, which is in turn caused by their mental peculiarities, should not be confined in institutions for the insane, as they are at least capable of self-support, and often of quite efficient work under certain favorable conditions in which they can not be placed in the naval service.

Between sanity and insanity there lies a vast borderland within the confines of which there is a great army of individuals with unstable nervous and mental organizations. These individuals compose the class of people variously designated as "cranks," faddists, Utopian dreamers, certain types of "inventors," pseudo-geniuses, sexual perverts, one-sided personalities, and eccentrics or mattoids "with wild, altruistic, impersonal theories, to which they often give vent in voluminous books or in harangues to crowds."¹ They are really characterological anomalies, and can not be considered as suffering with mental diseases. In this class some authorities, notably Tanzi, even place true paranoia, which has usually been regarded as a rare form of mental disease. This large class of people occupies the borderland between sanity and insanity. While they are not normal individuals, the mental activity of a large percentage of them expresses itself in

¹ Stoddart: *Mind and Its Disorders*.

such a way as to cause them to be considered merely as harmless "cranks," whom it is entirely unnecessary to confine in institutions for the insane. It is only when their peculiar ideas render them incapable of adjustment to their surroundings or harmful to others that their sequestration becomes necessary. No matter what the degree of physical perfection of these individuals may be, they are as unsuitable for adaptation to the naval service as the eagle is unsuitable for mating with the swan. Sooner or later they are quite likely to become general court-martial offenders. This is especially true of sexual perverts, several of whom have been admitted to the hospital from the Navy. Irregular sexual habits are often found among the insane and degenerates, but sexual perversion does not of itself constitute insanity. There are thousands of such individuals in every large city who are self-supporting, and many of them have successfully held high positions of honor and trust until their irregular sexual habits have become known. Then they become *persona non grata*, and few persons, excepting their own kind, care to associate with them. They are "men without a country." The same remarks apply to many other one-sided personalities and "queer" people. If these people were all confined in penitentiaries, reform schools, and institutions for the insane, those confined in institutions of this character would outnumber the unconfined. The French have a saying to the effect that "Half the world is off, and the other half is not quite on."

There is being established at the Naval Hospital, Washington, D. C., a psychopathic ward for the observation and treatment of certain insane officers and enlisted men of the Navy and Marine Corps. This ward, I am certain, will prove an excellent adjunct to the service in adding to the efficiency of its Medical Corps. Cases of slight or temporary mental disorder can easily be cared for in this ward until they get well; they will be at all times under the immediate control of officers of the service, and they will escape the stigma of having been an inmate of an insane asylum. In this way the best interests of the mentally sick officers and men will be subserved. It is my opinion that a small percentage can, after their recovery, properly be restored to duty, but the great majority will, I think, be found unfit for further continuance in the service on account of their liability to other and more severe attacks on exposure to the same service conditions which caused their first attack.

The transfer of an officer or enlisted man to an insane asylum is a very serious proposition. It greatly damages, and in some cases ruins, all their future prospects. Neither the Navy nor the Marine Corps want them any longer after they have been discharged from such an institution, and they are confronted with the same attitude on the part of other employers of labor, and those with whom they

come in contact in every walk of life. They are looked upon with a certain degree of suspicion, and people generally seem to desire to avoid them as much as possible. As a consequence it is often very difficult for them to secure employment. In order to do so it is often necessary for them to lie or conceal the fact that they have been patients in an insane asylum. This is difficult to do, because any would-be employer of labor is almost certain to ask them where they were last employed. The information that they have been patients in an insane asylum instantly kills any chance of securing employment in any capacity. In other words, the stigma of having been in an insane asylum is upon them. This stigma is quite unreasonable and unfounded, but its existence is none the less real, and is a condition, not a theory. They seem to be put in the same class with criminals and inmates of penitentiaries. No one wants to trust them in any business enterprise. All of these difficulties may be avoided by caring for temporary cases of nervous and mental disorder in the psychopathic ward of a naval hospital. It is a fine blunder to transfer an officer or enlisted man to an insane asylum who manifests only a few temporary or no symptoms at all of mental disorder after his transfer to that institution, and it is an equally fine blunder not to transfer to an insane asylum a man suffering with a chronic mental disease, often of very insidious onset, like general paresis and some cases of dementia præcox, or to punish in a naval prison, on sentence of general court-martial, a man who is mentally irresponsible and has committed some offense while in this condition.

TABLE NO. 7.—*Time of insanity becoming manifest.*

Within 15 days after enlistment.....	5
Within 6 months after enlistment.....	23
Within 1 year after enlistment.....	24
After 1 year after enlistment.....	89
Total.....	141

According to the official statements of naval medical officers made in reports of medical survey and health records which have accompanied each of the 141 patients shown in Table No. 7 to the hospital, only 32 occurred in "line of duty." Twenty-eight of these thirty-two cases were "incident to service" ranging in length from 1 to 27 years; 1 was a sequel of typhoid fever; 1 a sequel of a blow on the head, accidentally received aboard ship, and 1 was clearly due to syphilis innocently acquired from an infected enlisted man aboard ship whose disease had been concealed.

Of the 109 cases of insanity which did not occur in line of duty, 79 were considered to have existed prior to enlistment, 11 were due to excessive alcoholic indulgence, 9 were due to syphilis, 4 developed in

general court-martial prisoners, and had no connection with duty, 3 were due to hereditary influences, 2 were congenital mental weaklings, and 1 was due to the use of drugs.

Seventeen of the men here considered had on one or more occasions, prior to enlistment, been patients in institutions for the insane. Four of those discharged as "recovered," or as "not insane," are known to have again become insane and have been readmitted to hospitals for that class of patients. There may be others of which I have no knowledge, but these few cases of recurrences among the comparatively few cases of insanity here considered show the extreme liability for the recurrence of attacks of mental disorder among those who have once been insane. As a further illustration of this general tendency on a larger scale, I quote the following paragraph from Rosanoff's translation of the latest edition (1911) of de Fursac's *Manual of Psychiatry*:

Of a total of 6,689 cases admitted to the hospitals for the insane in the State of New York during the year ending September 30, 1908, 1,388 were cases of readmission. That is to say, that minute fraction of the population which consists of patients discharged from asylums has contributed over 20 per cent of all the admissions.

Among the 141 cases of insanity under consideration, there were 15 general court-martial prisoners, 5 patients who had had one or more deck court-martials for various offenses, and 3 patients who had had one or more summary court-martials. There were 14 other patients who had committed serious offenses, such as desertion, theft, drunkenness, etc., for which they would undoubtedly have received general court-martial sentences had not their defective mental conditions been discovered before their cases came to trial by court-martial. Several of these 14 cases had been served with charges and specifications for offenses which they had committed, but these were withdrawn when it became known that they were insane. One man, a warrant officer, was arrested by the civil authorities for killing his wife while ashore, tried, sentenced, and confined in a State penitentiary for several months before the fact became known that the officer was really suffering with dementia præcox. Kraepelin¹ asserts that mental disorders occur 10 times as frequently in prison as in freedom. It is my opinion that every general court-martial prisoner should be carefully examined by a medical officer trained in psychiatry for evidence of mental disorder, or constitutional mental inferiority, before he begins to serve a long general court-martial sentence in a naval prison. I believe that if the truth were made known by such an examination of the prisoners now serving general court-martial sentences in naval prisons many of them would be found mentally defective to such a degree that it would be fairly

¹ Kraepelin: *Psychiatrie*, 1911, Achte Auflage, Bd. 1.

presumable that they were not mentally responsible for the acts which they committed at the time they were committed.

An analysis of the characters and cases of the general court-martial prisoners who have been committed to the Government Hospital for the Insane as insane makes it quite evident that the offenses which they committed in the service and for which they were court-martialed could have been predicted with a fair degree of certainty before they were committed.

Desertion, drunkenness, and fraudulent enlistment are the most common offenses of these insane men. One does not have to be gifted with extraordinary imagination to predict that a young man who prior to enlistment has been wandering about the country from one job to another, never remaining in one place more than four or five months at a time, frequently idle or frequently drunk, or both, who has been arrested by the police on various occasions and confined in jails, workhouses, reform schools, or insane asylums, is very apt to become a general court-martial prisoner in the service. On the contrary, it would be somewhat surprising if he did not become one. Men do not change their habits with near the facility that they change their clothing. The hobo or tramp prior to enlistment will be the deserter or absentee without leave after enlistment. The chronic alcoholic before enlistment will sooner or later be found drunk on duty or neglecting his duties. They simply can not help it, and it is unreasonable to expect them to conform to the Navy Regulations for any great length of time, certainly not for the four years of their enlistment. It is inhumane and does no good to punish an imbecile or mentally defective individual for crimes or offenses for which he is either not at all or only partially responsible.

There were only 2 cases among the 141 here considered who could be classed as malingerers. Feigning insanity does not seem to be much in favor among enlisted men as a means for getting out of the service. Malingerers are generally psychopathic individuals anyway, and this was true of the 2 cases found. They had real symptoms of mental disorder in addition to those feigned and their malingering was really only an expression of their abnormal personalities.

The presence of tattooing among the insane of the Navy possesses some interest, but I think it is rather barren of any special significance. Of the insane men of the Navy, 49 of the 141 were found to have tattooed designs on their bodies. These designs were for the most part the usual patriotic, sentimental, or religious designs common among enlisted men. Obscene or unusual designs were rare. Designs of emblems of Masonic and other secret societies, snakes, daggers piercing flesh, revolvers, and the half-clad figures of the demi-monde were occasionally found. Tattooing on the body of an indi-

vidual is regarded by some authorities as a form of acquired stigmata of degeneracy.

There is apparently a marked increase in the number of cases of general paresis in the naval service. In searching the records of the Government Hospital for the Insane for cases of this uniformly fatal mental disease among 634 admissions I could find but 27 cases occurring during the period of 10 years and 5 months covered by my report on "Insanity in the Navy." During the 19 months covered by this report there have been admitted into the hospital 15 undoubted cases of general paresis and 5 cases of cerebral syphilis.

The histories of these cases of general paresis and cerebral syphilis previous to and subsequent to admission to the hospital are interesting. In all of them the Wasserman test was applied at least once, and in several cases on five or six occasions, both to their blood serum and cerebrospinal fluid, and it was uniformly positive for syphilis in each instance. In only five cases was there any obtainable history of a previous attack of syphilis. Three of those who denied syphilis possessed old scars suggestive of syphilitic lesions. Nine of the paretics and syphilitics here considered were known to be married men, and the majority of them had families. Four have died of general paresis since their admission to the hospital and three others are bedridden and in the last stage of the disease now. It is interesting to note that five of these cases of general paresis were originally diagnosed "neurasthenia," and one case was originally diagnosed "psychasthenia" by naval medical officers.

It is now the commonly and widely accepted opinion among alienists and neurologists that general paresis is primarily caused by a previous attack of syphilis, which may have occurred as long as 20 years before the onset of general paresis. The evidence on this point is becoming overwhelmingly greater every year, especially since the advent of the Wasserman reaction for testing the blood serum and cerebrospinal fluid.

Dr. William H. Hough, a staff officer of the Government Hospital for the Insane, who has for more than two years been devoting his entire time to the making of Wassermann tests of the blood serum and cerebrospinal fluid of the patients in that institution, tells me that he applied this test to 162 cases of general paresis which were clinically typical or confirmed histologically and found that 96.9 per cent of them gave a completely positive reaction in the blood serum, 2.5 per cent gave a partially positive reaction, and only 0.6 per cent were negative in the blood serum. He tells me further that when he applied the test to the cerebrospinal fluid of these same patients that 80 per cent of them gave positive Wassermann reactions for previous syphilitic infection. Kraépelin, Wassermann, Stier, Fournier, Ballet,

and Schuppius and many others are all agreed that lues is the absolute prerequisite for the development of paresis. Kraepelin says:¹ "We must consider syphilis as the only true cause of paresis." Wasserman says:² "Without syphilis there is no paresis." The actual determining or exciting cause of general paresis, however, yet remains rather doubtful; but it may be safely said that the exciting cause is always some form of stress, mental or physical. Kraepelin says (l. c. s. 800):

Why an isolated syphilitic becomes paretic we are unable to say, I believe, as little as we know why lues terminates one time with secondary symptoms and at another time calls forth tertiary manifestations.

The luetic origin of general paresis having been accepted, the disease is practically placed in the same class with other venereal diseases. This reopens the question of giving "line of duty" to general paretics. In the 15 cases of paresis and 5 cases of cerebral syphilis here considered, 15 men were given "line of duty, incident to service," varying from 8 to 27 years and 5 men were given "not in line of duty," because in that number of cases there was an obtainable history of syphilis. The laboratory test devised by Wassermann places all these men in the class of syphilitics. It seems quite unjust to give some men "line of duty" and others "not line of duty" for the same disease having the same common venereal origin, merely because in one case the afflicted men admit having had syphilis and in the other case the fact is denied or concealed. I do not believe that any case of paresis should ever be considered as "incident to service," unless it be clearly shown that the necessary preceding attack of syphilis was acquired in line of duty, as indeed one of the cases here considered really so happened.

Admitting that syphilis prepares the ground upon which paresis later develops, attempts have been made to establish a causal relation between various forms of stress occurring in the service, such as mental or physical overwork, service in the fireroom, head injuries, tropical service, etc., and the development of general paresis, with a view to giving "line of duty" for the disease. Thus far these and other factors have not been proven to be a cause, either determining or predisposing, of general paresis. Even if it could be proven that these forms of stress were contributory factors in the development of paresis, the fact would still remain that "without syphilis there can be no paresis," and no matter what the form of stress might be or its degree of severity, the individual would not become paretic unless he had previously had syphilis. In other words, in the absence of syphilis he would have safely weathered the storm, so to speak, of any form or degree of stress without becoming paretic.

¹ Kraepelin: *Psychiatrie*, 1911, Bd. II.

² *Artzl. Sachverst. Zeitung*, 1911, Nr. 1.

Dr. Schuppius, a German army surgeon, writing somewhat extensively on "the question of service influences in paresis,"¹ concludes, from his own observations and after giving due regard to the literature on the subject:

First. Paresis can never be caused through service influences, but is only hastened in its development, therefore demonstrably aggravated.

Second. Certain physical and mental exertions, general influences of the military service, thermic influences, and infectious diseases play no demonstrable rôle.

Third. An etiological connection is only to be found between paresis and severe cranial injuries concurrent with concussion of the brain, and in very rare cases also in spinal injuries and mental shocks, provided severe mental disturbances appear either immediately after the injury, or if we may follow the symptoms continuously from the time of the trauma and the outbreak of the disease, within a period of at least one to two years.

On the other hand, it would seem an unduly hard fate to cast the family of a faithful, long-service enlisted man, perhaps a chief petty officer, who has given 15, 20, or 25 of the best years of his life to the service, upon the cold charities of the world, a charity often harder than adamant. And yet few if any medical officers doubt the propriety of giving "not line of duty" for the ordinary case of syphilis, the venereal origin of which is known and acknowledged, no matter whether it occurs in an enlisted man who has been but a few days in the service or a wardroom officer.

A very large percentage of paretics are middle-aged men, continuous or long-time service men, and officers who have had a good many years' service. A large percentage of them are married men, who, in their younger days, loved not wisely but too well. "Line of duty" means very little to these men individually, for if their disease runs its ordinary course, and it generally does, most of them will be dead within three years from the time the first symptoms of the disease became manifest, and in any event their dementia will have become so profound in a much shorter time that they will be quite incapable of appreciating "line of duty" or anything else. Not so their unfortunate dependent families. "Line of duty" means everything to them—bread, clothing, the necessities of life.

It seems to me this problem of "line of duty" might be very well and very equitably solved by abolishing the question of line of duty altogether in considering the retirement of officers or claims for pension for enlisted men, at any rate so far as brain syphilis and the parasyphilitic diseases, tabes, and general paresis are concerned, and in lieu thereof, giving each of the officers or men retirement or a pension proportionate to their length of service in the Navy. Thus 30 years might form the denominator of a fraction, the numerator of which would be the number of years' service an officer or enlisted

¹ Deutsche Militärärztl. Zeitschr., 1911.

man had given the Navy. Then a man who acquires cerebral syphilis, becomes parietic or tabetic, after, say, 10 years' service, would receive ten-thirtieths of the full retired pay, or the full pension, as the case might be, of an officer or man who had spent 30 or more years in the service. Thus, the question of the origin of these diseases would not arise, and an officer or man would receive the exact proportion of pension or retired pay to which his length of service entitled him, and no more.

Under the present scheme, failure to give an officer or man "line of duty" for these diseases results in their not getting credit and well-earned pay for long service, while the retirement of officers or pensioning of men as the result of giving "line of duty" virtually puts a premium on the acquisition of these incapacitating venereal diseases, and in nearly all cases the men affected receive much more compensation in the way of retired pay and pensions than they are justly entitled to. Of course, it may be urged that no officer or enlisted man would willingly acquire any of these diseases for the sake of retirement or pension. Nevertheless, it is quite unjust to others in the service to retire an officer who has had, say, only 10 years' service, with full three-fourths of the pay of his grade on account of the acquisition of a venereal disease, while others in the service must serve at least 30 years before they can enjoy a like privilege.

A casual inspection of merely the photographs of some of the insane enlisted men of the Navy and Marine Corps, hereinafter given, serves to show that a good many degenerate and feeble-minded individuals are being accepted for enlistment who should not be recruited. I believe that if each enlisted man were required to serve a probational term of six months before being finally accepted for a four-year enlistment, medical officers would be able to weed out and eliminate from the service a large number of such degenerates. If, in addition to this probational term, medical officers with some psychiatric training were stationed at each of the principal training stations, such medical officers could be instrumental in eliminating from the service still more mental defectives of this type. It is a pure waste of time for either a line or medical officer to attempt to teach a dummy or imbecile who, if he remains in the service, is sooner or later almost certainly destined for one or both of two places, a naval prison or an institution for the insane.

A few remarks concerning the histories of the enlisted men whom the following photographs represent may be of interest. The limits of this article do not permit a more complete description. Two views of the same case are given in a few instances:

Figure 1 shows the hydrocephalic head and face of a man who was admitted to the hospital suffering from dementia præcox. He bore a heavy hereditary burden of many nervous and mental diseases in





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his immediate ancestry. His head was "tapped" when he was four or five years old. He was always dull and stupid and failed of promotion "several times" at school.

Figure 2 shows the macrocephalic head and small face of another congenital weakling who became sick with typhoid fever a short time after his entry in the service and subsequently became insane. His father was alcoholic; mother neurotic and tubercular. Though given "line of duty," he was undoubtedly strongly predisposed to insanity before he entered the service, and his attack of typhoid fever acted as an exciting cause for the onset of mental disorder.

Figures 3 and 4, a case of hebephrenic dementia præcox. Mental disorder became apparent in this case the next day after enlistment. He is hopelessly insane, and the Government will probably be under the necessity of clothing and feeding this young man for the remainder of his life. Not a very good investment for the Navy or any other department.

Figures 5, 6, and 13, constitutionally inferior young men, whose lives prior to enlistment had been careers of failures and in whose parents and relatives were many cases of nervous and mental diseases.

Figure 7, a high-grade imbecile.

The Jewish stock-market "plunger," heretofore described, is shown in figure 9.

Figure 10 represents the face of a degenerate.

Figures 11, 22, 28, 29, and 43, cases of catatonic dementia præcox.

The self-confessed sexual pervert, heretofore described, is shown in figure 12.

Figure 14, a precocious young man whose wanderlust spirit caused him to abandon a nearly completed college course to lead a hobo life. He finally enlisted in the United States Marine Corps "to see the world," and soon thereafter became insane.

Figure 15, a typical hobo, who had twice been a patient in hospitals for the insane prior to enlistment.

Figure 16, a case of post-traumatic psychopathic constitution (history of severe head injury received when 13 or 14 years old which nearly resulted in his death). Prior to the discovery that he was insane, his pernicious activity as a "sea lawyer" aboard ship became very obnoxious to the officers before whom he pleaded his "cases."

Figures 17, 18, 40, and 44, callow youths whose credulity was so great that they would believe almost anything told them.

In figure 19 is shown a very defective Russian Jew who enlisted in the United States Marine Corps. He was very dull and stupid, and became insane less than six months after enlistment.

In figures 20 and 21 is shown the puerile facial expression of a congenital mental weakling.

Figure 23, a chronic alcoholic habitué.

In figure 24 may be seen something of the silly facial expression of a case of hebephrenic dementia præcox.

Figures 25, 36, 37, 47, and 48, professional hobos and ne'er-do-wells.

Figures 26 and 27 represent a criminal type of individual who escaped from an insane asylum and beat his way several hundred miles on railroads to enlist in the Navy. He was an alcoholic, morphine, and cocaine habitué.

In figures 30 and 31 is shown a quite defective type of negro who became insane a very short time after enlistment.

Figures 32, 34, 39, 42, 45, and 46, defective types of enlisted men.

Figure 33, an epileptic degenerate.

In figure 35 is shown a case of alcoholic hallucinosis, following a prolonged debauch.

Figure 38 shows the simian face of a constitutionally inferior type of enlisted man.

In figures 40 and 41 is shown an imbecile who prior to enlistment had served sentences in both a reform school and a penitentiary.

In conclusion I desire to again express my heartiest thanks to Dr. William A. White, superintendent of the Government Hospital for the Insane, for photographs, for free use of the records, and for his unfailing courtesies extended to me during the nearly three years it has been my pleasure and privilege to work among the insane under his direction.

ROACHES AND THEIR EXTERMINATION BY THE USE OF SODIUM FLUORID (NaF).

By Medical Inspector M. F. GATES, United States Navy.

All of us who have been more than a short time in the naval service have had our troubles with roaches, and the food supplies, books, and, it is solemnly affirmed, even the toenails of the personnel of the Navy have long suffered from their ravages.

These things have been borne and considered as a necessary part of our seagoing experience. We have even realized to some extent how the insects can convey disease, and there is reason to believe they have been responsible for the continuance and spread on board ship of typhoid fever. The evidence as to other diseases is less direct, but there is no doubt as to the possibility that they may play an important part in the dissemination of diphtheria, tonsillitis, and tuberculosis, carrying the organisms on their feet and in their intestinal canals.

On some ships, especially older vessels with much woodwork, furnishing crevices in which they could hide, they have existed in enormous numbers, and there are few vessels of even the most modern construction where an inspection, made after dark, of the pantries

and galleys will not show a surprising and most unpleasant state of affairs.

About a year ago an effort was made to rid the *Solace* of roaches, and nearly 400 pounds of a preparation, selling at 80 cents per pound, was distributed throughout the ship by the officers of a company exploiting the secret formula.

The prevalence of roaches was greatly reduced, but they were by no means eliminated, and they gradually increased and again became a pest. This powder was largely placed where it would remain undisturbed, but it obviously contained organic matter, and it is believed that the active ingredient was a species of hellebore. In places which at any time became damp this powder decomposed and left an objectionable gummy mass, and where it remained dry it appeared to soon lose its value.

In discussing the cockroach question with Mr. C. B. Millwood, chemist of the New York Navy Yard, he informed the commanding officer of the *Solace* that the active ingredient of the best secret "cockroach exterminators" on the market is fluorid of sodium, and that the fluorid itself had been found thoroughly effective.

This substance is a dry, white powder, which, according to the dispensatory, has been employed medicinally in doses of 1 grain. It is also stated that 100 grains caused death, although no details are given. It is obviously of low toxicity.

A test has been made with sodium fluorid on the *Solace*, and, although at first wastefully used because the best method was not fully understood, the distribution of about 36 pounds has apparently entirely freed the ship of roaches. It has also been observed that there is a great decrease in the prevalence of the ubiquitous little red ant, and it is believed that they also are doomed to extermination on board.

A "pest exterminator" is carried on the *Gulgoa* for issue, 1-pound cans of which are marked "price \$1," and are invoiced to other ships at a little over 57 cents each. This exterminator is reported to have proved effective on the *Wabash*. On examination it is found to consist, apparently, of sodium fluorid alone.

The only advantage which sodium fluorid, purchased as such, possesses over the "pest exterminator" appears to be that of price, the cost being about 15 cents per pound (in 2-kilogram tins, supplied through Tiemann & Co., by John C. Wiarda & Co., Brooklyn, N. Y.), as against the 1-pound cans at 57 cents to \$1 each.

There is one point which must be emphasized to obtain the best results with sodium fluorid, and much depends upon it. The insects are not suffocated or intoxicated by it as they are by pyrethrum, nor are they attracted by it as they are by some of the honey and phosphorus "roach pastes" on the market. It should be so distributed that they walk through it. A small quantity adheres to the feet or

antennae, and the insect cleans it off with its mouth. Of course, if it is actually dusted on the insects the result is obtained in the same manner.

The deduction is that heaps of it are of no more value than a thin layer, and that it is to be spread in their runways, evenly and thinly distributed, where it will remain dry and powdery and will be undisturbed by any cleaning up process. Cracks and pipe holes, spaces behind furniture, pantry cupboards, under the bottom drawers of desks and berths, on top of pipes and fuse boxes, wherever a space is left between fixtures and corrugated iron bulkheads, on the back edges of storeroom shelves that not often need to be disturbed, behind the library books, about the potato lockers, and especially, every concealed cranny of galley, pantries, and scullery should be dusted with the fluorid.

We found, after wasting large amounts, handling it with spoons and spatulae, that the ordinary glass and rubber powder blower is a most effective means of distribution, supplemented in some places, such as storeroom shelves, by a whisk broom.

To summarize:

1. The cockroach is worse than a nuisance; its presence is dangerous.
2. It can be quickly, cheaply, and completely eliminated from ships or houses.
3. Sodium fluorid is efficient, and it is doubtful if anything else can equal it.
4. The method of use is important; the insects do not take it voluntarily, but lick it off their feet, so it should be dusted thinly but widespread where they are most numerous.
5. It should remain dry, so as to adhere to the feet of the insects when touched by them.
6. Further information, or demonstrations, will gladly be given on the *Solace*.

THE PROPHYLAXIS OF BOILS.

By Asst. Surg. E. W. PHILLIPS, United States Navy.

It is a common experience that when a cruising ship goes to the Tropics there occurs an increased incidence of boils among the crew, sometimes almost an epidemic. The cause of this must be a lowering of cutaneous resistance, since the virulence of the infecting organisms can hardly be altered by the climate. The skin is irritated and made more vascular by the sun's rays; perspiration is greatly increased and, because of the higher relative humidity, the skin is seldom dry. These factors favor infection and auto-inoculation of the patient; he may neglect treatment and infect ship's spaces with the discharge from the boil; so the disease spreads. Such a condition may be prevented or checked by relatively simple means.

In April, 1911, when this ship (U. S. S. *Paducah*) had been lying off the Nicaraguan coast for three months, an epidemic of boils broke out in the engineer's division, affecting about one-fourth of the men. The following measures were applied: The engineers' washroom, lockers, and the underclothing of the men were disinfected with live steam or boiling water. Particular attention was paid to towels and wash cloths. Each man when he came off watch added two tablespoonfuls of 40 per cent formaldehyde solution to his wash water, dried himself with a clean, dry towel, and dusted his body over with finely-powdered starch containing 2 per cent each of boric and salicylic acids. Every man having any skin infection was made to report daily for treatment until cured. One, who suffered severely from furunculosis, was kept on the sick list and successfully treated with autogenous vaccine of micrococcus aureus. No more boils occurred in this division during the remaining three months of the tropical cruise. The use of the formaldehyde was stopped, but the dusting powder was continued and the washroom disinfected monthly.

At the beginning of the present cruise, October, 1911, it was decided to test the prophylactic efficiency of these measures. Instruction was given all divisions as to the use of the dusting powder, the importance of regular bathing and of clean, dry towels and underclothing. At this writing (February, 1912), no boils have occurred among the engineers' force, and few in the other divisions.

Ordinary corn starch mixed with 2 per cent each of boric and salicylic acids is put into large salt shakers, such as are furnished the crew's mess, and placed conveniently in the washrooms. The addition of a strong cheap perfume is found to increase the use of the powder by the deck force. The results have abundantly repaid the slight trouble and expense.

(Well worthy of consideration in connection with the above article is the following extract from the last annual sanitary report (1911) of the U. S. S. *Washington*, by Surg. J. H. Iden, United States Navy, and comment thereon by Medical Director James D. Gatewood, United States Navy.—Ed.)

"The Navy ration, while varied and plentiful, in my opinion is faulty, inasmuch as it is practically the same in the Tropics as it is in cold climates. Entirely too much meat is used when cruising in tropical countries. On this ship there have been a great number more or less invalided for days on account of boils and other skin manifestations resulting from overindulgence in meat diet. The scarcity of fruits is especially noticeable, inasmuch as bumboat men are not allowed on board. It is manifestly impossible to issue to the men the amount of fruit they should have, nor can it be handled in the canteen, due to insufficient room, insects, etc. As a rule fruit is very cheap in tropical countries, and if it were possible to permit bumboats alongside at regular times and, after a careful inspection

by the medical officer, permit the sale of fruit on board, I believe it would greatly lessen constipation, skin manifestations, and otherwise promote the health of the crew."

The expression of opinion by Medical Director Gatewood is given below:

"Prior to 1902 the ration contained much less protein than is found in the present ration, yet the admission ratio of boil has been less since that date. In 1895, 1896, and 1897, when there was less meat and much less cruising in the Tropics, that admission ratio was 16.22, 14.37, and 14.99, respectively; while in 1903, 1904, and 1905, with a larger meat ration and more cruising in the Tropics, it was 12, 12.08, and 10.91, respectively. The admission ratio in 1910 was only 6.11, which is quite remarkable considering the small variations in the years prior to 1906. In fact, the damage in percentage of sick from all diseases of the skin and connective tissue in 1910 was only 0.152, omitting scabies and trichophytosis. That was much below the average (0.223) of the 10 years 1895-1905, which included 6 years of less meat and 3 years of less tropical cruising.

"While it is generally thought that boils tend to appear more frequently in warm weather, when the skin is more active, its blood supply greatly increased and personal cleanliness more imperative, and conditions in general are more favorable for the multiplication and activity of the pus-producing organisms, yet, it has seemed at times that boils in number appear in hot weather perhaps more often in those whose nutrition is lowered or altered than in those utilizing their food. At any rate, crews of ships in hot climates living on the sea ration tend to a lowered vitality and to pus formations, but show improvement when fresh provisions are issued frequently or more frequently. It would therefore seem to follow that character of the intake, including meat, is at least as much worthy of consideration as quantity. In that connection fresh fruit becomes a factor.

"It does not appear from the extract of the report of the medical officer of the *Washington* whether the crew of that ship when in the Tropics had less frequent issues of fresh meat or *whether the facilities and requirements for keeping clean skins were satisfactory*. It does appear that the sale of fruit to the men was unduly restricted from the point of view of satisfactory nutrition, or even prohibited. However, there is no knowledge here of whether there were conditions on shore making such traffic undesirable from a larger sanitary point of view. The inference is that such was not the case. In the latter event, in view of the statement that 'it is manifestly impossible to issue to the men the amount of fruit they should have,' it appears from a sanitary point of view that the crew was not given an opportunity of which men in the Tropics should not be deprived in a routine way.

"It seems true that, in view of its high specific dynamic action, the ingestion of abundant protein in hot climates makes for discomfort and excessive skin activity in the effort to rid the body of the heat it is producing in excess. It may, therefore, be considered that Voit's standard is a more suitable one *for the Navy in the Tropics* than the usual Navy ration. However, in view of the proviso of March 2, 1907, relating to underissues, and in view of the reduction in the admission ratio of boil under the present ration as modified by that proviso, the theoretical considerations do not appear to be sufficient to warrant a change that seems to be opposed by practical results. Nevertheless, in the Tropics when fresh meat happens not to be available, or rather when the sea ration has to be used when supplies of fresh fruit are available, the value of much of the fat that ration contains could be expended to better advantage in securing additional fresh fruit, in which the allowance of the ration is too small for hot climates. That ought to become practicable through underissues, and was practicable with commutation. If it is now practicable, the question of fresh fruit, even without expense to the men, would seem to depend largely upon local administration."

**DAMAGE TABLE FOR PHYSICAL DISABILITY IN UNITED STATES NAVY,
1910, INTERNATIONAL NOMENCLATURE.**

By Surg. CHARLES N. FISKE, United States Navy.

The accompanying data have been computed from Table 15, Annual Report of the Surgeon General, United States Navy, 1911, and arranged for record and for the benefit of those who may desire to compare the total damage from sick days, invalidings and deaths in terms of percentage of sick for the year 1910 with the figures for 1909 published on folder in the Bulletin of April, 1911. (Vol. 5, No. 2, p. 149.)

From the growing influence of Medical Director Gatewood's "Naval Hygiene," the method for computing damage devised in its first chapter and practical instruction therein at the Naval Medical School there is a small but increasing number of medical officers who have become accustomed to thinking of damage reduced to a common denominator—the decimal to be formed after each number of the International List.

There are those for instance who, without going to no little study and review to make calculations for themselves, wish to compare damage from venereal diseases from year to year and then opine for themselves whether a reduction is positively correlated with the practice of venereal prophylaxis. This can not be done intelligently so long as one has to think in terms of sick days, invalidings and deaths; he must have a ratio between the computed disability (including all three factors) and the greatest possible disability if the

entire personnel were sick therefrom for the whole year. For the majority a damage curve plotted in the mind or on paper for the several years will be sufficient, while others may wish to apply a coefficient of error or some correction for what appears to have been a normal variation of yearly damage.

The damage from venereal disease (Nos. 37, 38A and 38B) appears to be 11.5 per cent less during 1910 than for 1909. The reduction is noted in all three affections but is greatest for syphilis, less for gonorrhea, and least of all for chancroid.

The damage from alcoholism, 0.021117 for 1909 and 0.016918 for 1910 shows a decrease of nearly 19.9 per cent.

Similarly the damage from tuberculosis of the lungs, No. 28, was reduced from 0.269207 to 0.210833, or nearly 21.7 per cent.

All these figures show unsuspected and encouraging reductions when compared with the 10-year damage tables found in Gatewood's "Naval Hygiene."

Many other comparisons can be quickly made of much interest and importance and a study of such figures should enable any medical officer to realize the movements of disease in the service and to reason more intelligently as to the cause of any fluctuation beyond the so-called "normal" which should ever decrease as our understanding of causation of disease and preventive medicine increases.

Damage table of causes of physical disability in United States Navy, 1910.

International number.	Damage in terms of percentage of sick.	International number.	Damage in terms of percentage of sick.	International number.	Damage in terms of percentage of sick.	International number.	Damage in terms of percentage of sick.
1.....	0.054539	61a.....	0.001658	99B.....	0.001033	147.....	0.047231
4.....	.035648	62.....	.002963	100.....	.086970	149.....	.180383
5.....	.006624	63.....	.002711	101.....	.001100	150.....	.016558
6.....	.048400	64.....	.002884	102.....	.006606	155.....	.003448
7.....	.008875	66.....	.013582	103.....	.028532	156.....	.001724
8.....	.000202	67.....	.001066	105.....	.023206	157.....	.001724
9.....	.015556	68.....	.107460	108.....	.001383	158.....	.002586
10.....	.034097	69.....	.062912	107.....	.001398	159.....	.007758
12.....	.001158	72.....	.003236	108.....	.071750	165A.....	.001082
14.....	.024719	73B.....	.016145	109.....	.135011	165B.....	.006380
18.....	.001708	74.....	.096158	110A.....	.010724	167.....	.024077
19.....	.143725	75B.....	.008940	110B.....	.007420	168.....	.002954
20.....	.031014	75C.....	.159747	111.....	.001435	169.....	.091362
24.....	.000862	76.....	.156714	113.....	.004748	170.....	.015380
28.....	.210833	77.....	.001085	114.....	.000912	171.....	.015609
29.....	.001003	78.....	.006814	115.....	.020046	172.....	.000862
34.....	.006595	79.....	.116644	116.....	.000097	174.....	.000862
37.....	.334037	80.....	.003639	117.....	.007463	175.....	.000862
38A.....	.144787	81.....	.004663	118.....	.001546	177A.....	.001275
38B.....	.356196	82.....	.000296	119.....	.015546	178.....	.001435
44.....	.002944	83.....	.078731	120.....	.022774	179.....	.002755
45.....	.003910	84.....	.024048	122.....	.004925	181.....	.000257
46.....	.001198	85.....	.038570	123.....	.007708	182.....	.002586
47.....	.061541	86.....	.021216	124.....	.032121	183.....	.001724
48.....	.049569	87.....	.003422	125.....	.000034	184.....	.001724
50.....	.005738	89.....	.035649	126.....	.000282	185A.....	.022646
51.....	.007957	90.....	.036243	127.....	.012283	185B.....	.037556
53.....	.002082	91.....	.011633	142.....	.001085	185C.....	.113013
54.....	.006776	92.....	.069855	143.....	.013193	186.....	.228049
55.....	.009083	93.....	.038222	144.....	.060325	189A.....	.013602
56.....	.016918	94.....	.000954	145A.....	.003668	189B.....	.000131
59.....	.017121	96.....	.010843	145B.....	.022686		
60.....	.001833	98.....	.002415	145C.....	.066137	Total.....	4.448199
61.....	.003362	99A.....	.022380	146.....	.025763		

INDICATIONS FOR INTUBATION AND TRACHEOTOMY.

By Passed Asst. Surg. G. B. TRIBLE, United States Navy.

There is a scarcity of literature obtainable in the service on these surgical procedures, yet owing to the multiplicity of duties of the naval medical officer it is only a question of time until he may be confronted by the necessity of performing one or both of these operations.

The indications as given below are the ones accepted and used in the Karolinien Kinder Spital, Vienna.

When respiration is impossible intubation is indicated—as in stenosis of the larynx. Stenosis of the larynx is divided into two stages:

1. Stage of compensation, characterized by stridor; the auxiliary muscles of respiration are brought into play; prolonged expiration; beginning cyanosis and orthnopea.
2. Stage of broken compensation. In this stage there is CO_2 narcosis. The symptoms of broken compensation are (a) cyanosis, (b) CO_2 narcosis, (c) emphysema.

Intubation should always be performed before the end of the first stage.

The rhinitis of sucklings may complicate and resemble stenosis, as may also pneumonia, but in pneumonia there is a different rise of temperature and a different respiratory chart.

Retropharyngeal abscess is also apt to cause confusion. There is the same difficulty of respiration and later stenosis. In case of abscess the head is usually held back. The throat should be palpated in all cases. Tuberculosis of the bronchial glands is a frequent cause of stenosis, but the condition is chronic, and there is no stridor.

The following are special indications for intubation, and oftentimes need to be followed by tracheotomy:

Acute conditions—

1. Diphtheria of larynx.
2. Laryngitis acuta (pseudo croup).
3. Pertussis.
4. Laryngeal spasmus (tetania).
5. Foreign body in larynx.
6. Poisoning by opium or morphine (with the use of artificial respiration).

Chronic indications:

1. Stenosis after diphtheria.
2. Decubitus from tracheotomy tube.
3. The granulomata, tuberculosis, lues, rhinoscleroma (practically unknown in America).

The following are contraindications for intubation and are indications for tracheotomy:

General:

1. When there is low nutrition, tuberculosis, lues, richets, cachexias, measles, and scarlatina (danger of ulcers).

Local:

2. Local contraindications may be classified according to location. (a) Above the larynx. (b) In the larynx. (c) Below the larynx.

Contraindications above the larynx:

1. Stenosis of pharynx, as caused by septic diphtheria.
2. Edema of the epiglottis.
3. Retropharyngeal abscess.

Contraindications in the larynx:

1. Ulcers.
2. Spasm of the glottis.
3. Laryngitis purulenta.

Contraindications below the larynx:

1. Pneumonia.
2. Diphtheria of the trachea or bronchi.

Ordinarily the tube can be removed after 48 hours; if there is danger of ulcer or tracheotomy is urgent, the tube should be removed sooner.

METHODS OF EXTUBATION.

The following methods of extubation are in general use:

1. After intubation the string on the tube is attached over the left ear. Pull the string and draw the tube out on the left side.
2. By the extubator.
3. Expression. (French method.)

DANGER OF INTUBATION.

Decubital ulcer is made by both the ends and the middle of the tube. By changing the size and the use of rubber instead of metal this may be avoided. Dip the next smaller tube in gelatine and powdered alum and use. The danger of decubital ulcer exists to a lesser extent in tracheotomy. The site of the ulcer varies in the two procedures.

Charts of time.

NORMAL COURSE FOLLOWING INTUBATION.

24 hours.	4.	24 hours.	10.	12 hours.	
In.	Out.	In.	Out.	In.	Out.

IN DECUBITUS.

24 hours.	4.	12.	8.	6.	2.	Tracheotomy
In.	Out.	In.	Out.	In.	Out.	If necessary.

The presence of decubitus may be known by the following signs:

1. The coughing out and expulsion of the tube.
2. Shortening of the periods of in- and extubation.
3. Pain on pressure over larynx.
4. Difficulty in swallowing.
5. Rust or blood on the tube.
6. Tube enters very easily.
7. Fever. (Hectic appearance.)

After intubation the cough may be worse temporarily. That the tube is in the larynx may be determined by the following signs: First, palpation; second, metallic cough and metallic breathing; third, pull the string attached to the tube; there is resistance.

Membrane may be over the tube and the tube must be withdrawn when this is the case. Blood will come when the membrane is rubbed away. Inhalations of steam are good in these cases. In cases of inability to swallow use rectal injections of nutritive enemas and saline solution. Swallowing can be facilitated by holding the head over backwards. The normal course of intubation is over in 80 hours, if not, a secondary tracheotomy is necessary. A secondary tracheotomy gives worse results than a primary.

If we have an ulcer, treat by intubation or by bougie.

Other than from ulcers and their sequelæ, the patient may fail to breathe from:

1. Forgetting.
2. Excitement. (Narcosis.)
3. Diseases of the larynx—periostitis, perichondritis, etc.

In some cases continuous intubation may be necessary, for instance, in strictures.

The intermittent method must be used when the patient is tubercular or has fever. The use of bougie can be made from below upward through a tracheotomy wound.

The methods of procedure and operations used were identical with ours; in placing the intubation tube it was guided by the finger over the epiglottis, the guiding finger going to the side of the tongue and posteriorly; the O'Dwyer set was always employed.

In tracheotomy the head was thrown back and the low operation (below the isthmus of the thyroid) was performed.

REPORT ON METHODS OF ADMINISTRATION OF AND RESULTS OBTAINED FROM "SALVARSAN" BASED UPON THE TREATMENT OF OVER 200 CASES OF SYPHILIS AT THE NAVAL HOSPITAL, MARE ISLAND, CAL.

By Passed Asst. Surg. JOSEPH A. BIELLO, United States Navy.

In the administration of this now well-known remedy to a series of 219 cases of syphilis at the United States naval hospital, Mare Island, Cal., during the year 1911, it is safe to state that the good results obtained from the use of the drug by many other observers are fully corroborated in this series. The result as a rule in all cases, whether the drug was administered intramuscularly by the neutral suspension method, or the alkaline method suggested by Lesser, or by the intravenous method, have been almost immediate and gratifying, particularly in those cases in which marked syphilitic lesions of the secondary or tertiary type were present, and in which long-continued treatment with mercury and iodides had proved of little benefit. This class of cases is of particular interest to the naval service, as men who would usually be compelled to remain in naval hospitals for months at a time under the old method of treatment

have, in a comparatively short period of time, been returned to duty after the administration of one dose of this remedy.

At the beginning of the administration of this drug those cases were chosen which presented the most marked secondary or tertiary lesions; cases in which the diagnosis of syphilis was unquestionable, and those that had resisted the mercurial and iodide treatment for months. In all the administration of salvarsan was followed by complete healing of the lesions present within a few days or a few weeks, according to the severity of the case, with a corresponding improvement in the general health. Of these cases one presented a most extensive ulceration of the pharynx, uvula, and tonsils—an ulceration which had totally destroyed the uvula and partially eaten its way into the pharynx and tonsils; there was complete healing of the entire fauces by healthy mucous membrane, and a general improvement in health with a gain of over 15 pounds in weight in less than 2 weeks, and in 19 days after the administration of the remedy the patient was discharged to duty. In a similar case with pronounced emaciation and extensive mucous patches of the vault of the pharynx and of the lower and upper gums at the base of the teeth, rendering mastication of food painful and almost impossible, healing was complete within a few days after an injection of the remedy, and in less than a month the patient had gained over 25 pounds in weight. In another case in which despite active treatment with mercury and iodides a syphilitic erosion had partially destroyed both alæ of the nose, with prospects of the erosion extending, one dose of salvarsan entirely checked the process. The resulting deformity was subsequently corrected by plastic operations with good results.

The method of administration used in the above cases and in a series of about 50 others was the intramuscular injection of Lesser's alkaline solution, with the exception that the injection was given in the muscles of the scapular region instead of the gluteal, as originally suggested by Lesser. In nearly every case thus treated, however, there was a rather acute pain experienced at the site of the injection and transmitted to the cardiac region, lasting for several hours and in some instances requiring a hypodermic of one-fourth grain of morphine a few hours after the treatment. At the seat of the injection an induration usually followed, which subsided very slowly, and in several cases, in a series of nearly 60 thus treated, a necrotic mass about the size of a walnut formed, which had to be subsequently removed by incision. This method of administering the drug was soon discontinued in favor of the intravenous method which is now employed without exception, and which, to date, has been administered in over 150 cases.

The technique of the intravenous method, as practiced at this hospital, is briefly as follows: With the patient in the recumbent posture on the table, the left arm is extended on a rest at right angles

to the body; the bend of the elbow is painted with tincture of iodine, and a tourniquet applied well above this joint, care being taken that the pulse is not obliterated. The veins usually show up well in a few minutes and the most prominent and accessible for the introduction of the needle is selected; in a majority of cases the median cephalic or median basilic is the most conspicuous. The straight needle answers the purpose very well, though one having a slight curvature may be of some advantage. The procedure at this hospital, however, has been carried on entirely with the straight needle with very good results. The ordinary salt infusion apparatus is used, the jar of which is suspended from a stand at a height of about 3 feet above the patient's arm.

About 100 cubic centimeters of salt solution are first placed in the jar and part of it allowed to run through the tube and needle until all air bubbles have been expelled from same; the stream is then shut off and the needle is applied directly over the chosen vein, hold-it at a very slight angle to it. The needle is then thrust gently through the skin and then cautiously into the vein, care being taken not to use too much force, as otherwise the needle may penetrate both the anterior and posterior walls of the vein, with the result that the operation has to be repeated.

As soon as the vein is entered the tourniquet is removed, the pinch cock on the rubber tube opened, and the salt solution allowed to run in.

By observing that the salt solution runs freely and that there is no swelling at the site of the puncture, we are assured that the needle is in the lumen of the vein. Before all the fluid runs out of the jar, the 300 cubic centimeters of previously prepared "salvarsan" solution are added and allowed to run in, this being again followed by about 100 cubic centimeters more of salt solution in order to wash the salvarsan from the vein. The needle is then withdrawn, a sterile pad applied with a bandage, for the first 24 hours, and the patient put to bed for 2 days. When the needle is inserted it is well that it be held in position by the operator throughout the entire procedure, in order to avoid any possibility of it slipping out during the process. If by chance the point of the needle is not in the lumen of the vein, a swelling caused by the salt solution running in the tissues around the vein at the site of the needle puncture will at once show it, and in this case the operation is to be stopped and repeated on another vein. This method of administering the drug intravenously has been followed in all cases in which the veins at the elbow show up well, owing to its superiority over the open method of dissecting out the vein; its principal advantages being that the vein remains patulous after the treatment, that there is no wounding of the tissues, less preparation, and a saving of considerable time in the operation.

Occasionally, however, cases present themselves in which veins are very poorly if at all made prominent by the use of the tourniquet,

the condition being usually met with in obese patients. In these cases only has it been necessary to expose a vein by dissection, and in a series of over 160, only 6 such cases have been encountered. When dissection of a vein is necessary an incision about three-fourths inch long is made under local anesthesia along the side of a vein, the position of which is ascertained by palpation. When the vein is reached, an aneurism needle with a double catgut ligature is passed under it, and the vessel is separated from the underlying tissues. The distal ligature is then tied, and by holding the vein up with the ends of the proximal ligature or, better, by a pair of tissue forceps, a slight nick is made with a pair of sharp scissors and a canula is introduced. The proximal ligature is then tied on the canula, and the solutions as above described allowed to run in. The canula is then withdrawn, the proximal ligature secured, the skin wound closed by one or two silkworm gut sutures, and a dry sterile pad applied.

No marked untoward effects have been noted in the entire series of cases treated intravenously, except slight nausea and mild occasional vomiting experienced by a very few of the patients.

The results obtained by the intravenous method have been highly satisfactory, and with the distinct advantage of being devoid of the troublesome local reaction obtained with the intramuscular method. Cases of primary sore and acute secondaries have particularly been followed by extremely gratifying results, though in all stages of the disease the disappearance of the lesions present has occurred without exception. In one case of chancre of the upper lip, with enormous swelling in the surrounding tissues and involvement of the submaxillary glands on both sides, the entire sore was healed and the swelling subsided in 10 days after the administration of the remedy. In this case the presence of the *treponema pallidum* had been demonstrated in a fresh preparation from the chancre before the treatment was given, and in 3 days after the administration of salvarsan not only had the *treponema* disappeared, but a Noguchi test proved negative. A patient with a tertiary lesion of the cord, in whom there was paralysis of both lower limbs and of the anal and vesical sphincters, the administration of one dose of salvarsan was followed by marked improvement, and after the second dose was given the patient was able to walk without the aid of crutches.

In three cases that were under treatment for gonorrheal rheumatism of long standing, and in which a history of chancre was elicited in addition to that of gonorrhea, salvarsan treatment was instituted with the prompt amelioration of arthritic symptoms, and the patients were finally sent to duty. In these cases the arthritic condition was undoubtedly wholly or in part of syphilitic origin.

Recurrence of lesions was infrequent, and in the entire series of cases treated it was necessary to administer a second dose in seven only. One of these was a man with syphilitic cachexia, who had

been confined to his bed for nearly three months and who responded feebly to the first dose; he gained over 30 pounds after the second was given and has since been discharged to duty. In another case, with iritis and extensive ulceration of both legs, the ulcers healed completely after the second dose; but the patient was invalided from the service, owing to partial blindness from the healed iritic condition.

In conclusion it may be said that while it can not be stated that salvarsan is a permanent curative remedy in syphilis, yet in it we have a powerful therapeutic agent, particularly for the immediate control of active lesions and general improvement in the patient's health. The mercury and iodide treatment, however, should by no means be considered as supplanted by salvarsan, but, on the contrary, it should be continued in every case as an adjunct to "606" and remain, in the estimation of the profession, as valuable a remedy as ever in the treatment of syphilis.

(With a view to comparing the methods of administering salvarsan in use at some of our other naval hospitals, inquiries were made with the following results.—Ed.)

Naval Hospital, Chelsea, Mass.—The salvarsan is mixed in the manner prescribed by Ehrlich. The left arm is usually selected, scrubbed, and painted with tincture of iodine, a tourniquet applied, and a large vein selected. A small area is anesthetized with 1 per cent solution cocaine, the vein carefully dissected out, and ligature tied on the distal portion. The proximal portion is then snipped with a pair of scissors, but not completely divided. Canula is inserted in the vein and tied while the salt solution is flowing. The salt solution is then cut off and the salvarsan permitted to flow, this being again followed by salt solution to clear all salvarsan from the tube. We have given 233 intravenous injections to date. (Surg. F. M. Furlong, United States Navy.)

Naval Hospital, Norfolk, Va.—During the past 12 months we have administered over 500 doses of salvarsan, 0.5 gram, in about 270 cases. There were no bad effects, except chills, fever, and vomiting in a few cases. It has been given with heart lesion, albuminuria, choked disk, and in extreme age, in doses of 0.25 to 0.3 gram, administered very slowly, with no bad effects. Modified Wassermann (Noguchi method) done before and after giving in many cases. Clinical symptoms cleared up before discharge to duty. Average time under treatment, 36.12 days.

TECHNIQUE OF ADMINISTRATION.

1. Remove "ampule" from covering, cleansing with bichloride or carbolic solution. Cleanse file in same way.
2. Seize "ampule" in sterile gauze, file junction of neck and body, and break with a quick bend.
3. Empty powder into 500 cubic centimeter flask containing 40 cubic centimeters of 0.9 per cent chemically pure sodium chloride solution, containing 30 to 40 glass beads (solid) the size of BB shot.

4. Rapidly agitate until clear solution is formed.
5. Add, drop by drop, 15 per cent solution of sodium hydrate, shaking after each drop is added. Continue until solution clouds and again becomes clear.
6. When absolutely clear and just alkaline in reaction to litmus paper, add 260 cubic centimeters 0.9 per cent chemically pure sodium chloride solution, shaking continually.
7. Filter, using sterile, white, Swedish filter paper.
8. Always wash out apparatus with salt solution of 100° to 110° F. before using.
9. Apply rubber tourniquet above elbow.
10. Sterilize arm, using iodine method.
11. Expose vein and remove tourniquet. Pick up fold of vein with mosquito hemostats. Tie off distal portion of vein, and loosely tie off proximal portion. Make V-shaped incision, apex distally placed.
12. Introduce a shouldered canula into vein, being careful not to strip intima. Tighten proximal ligature behind shoulder of canula.
13. Allow solution to run into vein by force of gravity at first, afterwards using small force pump.
14. After injection, remove canula, tie proximal ligature, close incision in arm, and bandage.
15. To insure all the solution being administered, add normal salt solution to bottle when empty.
16. Use Kelley's infusion apparatus.—(Surg. W. M. Garton, United States Navy.)

Naval Hospital, New York, N. Y.—We have administered 249 intravenous injections of salvarsan up to date. Excepting in 10 cases, all have been administered by directly exposing a vein, usually at the bend of the elbow. The above-mentioned 10 cases were given by needling the vein. Theoretically, this seems to be the ideal way, as it is more expeditious and does away with the resulting scar, which of course remains after the direct exposure, and which seems to be considered more and more objectionable.

Theoretically, the needling of the vein would seem the proper procedure, but practically in this hospital we have not found it very satisfactory. There is no trouble in sticking the needle directly into the vein as a rule, but we have found that it has been difficult to get into the vein the whole amount of the solution, viz, 300 cubic centimeters. Of course, the needle used in this method must be sharp pointed, and the least movement after it is once in the lumen of the vein might cause it to stick into the wall, thereby interfering with the flow.

Our method is as follows: Iodine sterilization, exposure through incision about one-quarter inch long directly over the vein, picking up vessel by aneurism needle or grooved director and insertion of a canula. We use an ordinary irrigator and precede and follow by a plain salt solution which absolutely prevents any of the chemical coming in contact with the surrounding tissue and thereby causing subsequent pain or necrosis. This whole procedure really takes very little longer than the needling, and in our hands has been much more satisfactory. (SURG. C. M. OMAN, United States Navy.)

DISTRIBUTION OF TUBERCLE BACILLI IN THE SPUTA OF TUBERCULOUS PATIENTS.¹

By Hospital Steward ROSCOE W. KING, United States Navy.

It is thought that the accompanying table showing the distribution of tubercle bacilli in the sputa of tuberculous patients will be of some interest, if not of real value, to those who may have occasion to examine suspected sputa for the acid fast bacillus of tuberculosis.

The table is limited to 424 cases, not for want of material, but for the better reason that the writer is personally familiar with every detail of the tabulated data.

For convenience, the cases are grouped according to their leucocyte count on admission to the hospital. It will be observed that the probabilities of finding the tubercle bacillus may, in a measure, be determined by a leucocyte count. Thus in those cases where the patient's white count exceeds 15,000 and tubercle bacilli are not found on the first examination the probabilities are very great, 24 against 1, that they will not be found in 10 consecutive examinations; and, furthermore, the leucocytosis is, in all probability, not due to pulmonary tuberculosis.²

The letters b, c, e, and f in the lines showing the results of the different examinations refer to the number of bacilli as recorded for the examination, as follows: b=very few; c=few; e=moderately numerous; and f=numerous. When the letters are followed by a question mark it indicates that contamination, accidental or purposeful, was suspected.

This table seems to show that the reason for failing to find the tubercle bacillus on the first, second, or third examination was not, as is currently intimated, due to the great scarcity of the organisms, for of the 13 cases not showing tubercle bacilli in three examinations 10, or 77 per cent, later—within a few days—showed the bacilli in large numbers. * * *

It should be borne in mind that a patient whose sputum is ordinarily loaded with tubercle bacilli can, when certain motives predominate, produce a specimen of sputum which is free from these organisms. It has been my experience that, when the patient will furnish the best specimen which he can produce on arising in the morning, tubercle bacilli will be found in 90 to 95 per cent of all the cases which will show the organisms at all.³

¹ The data presented in the present paper was gathered while the writer was on duty in the laboratory of the naval hospital Las Animas, Colo.

² If the first slide is negative a second one should be made from a different portion of the sputum. It is the writer's conviction that the careful examination of two preparations made from different portions of the sputum is preferable to any of the concentration methods yet devised, including the so-called antiformin (alkaline hypochlorite), etc.

³ The writer realizes that this is a dogmatic statement, and is at war with prevailing and stereotyped opinion, but it is based on many hundred sputa examinations—it is based on practical experience rather than theoretical deductions.

In closing I should state that the table only covers the first 10 examinations in each negative case. This is because I have no record of ever having found the organisms after the tenth examination, although many of the cases had from 15 to 20 examinations covering a period ranging from a few months to more than one year.

In preparing and staining preparations for tubercle bacilli I have proceeded as follows: The perfectly clean slide is heated by passing several times through the flame. The sputum, pus, feces, or other material is taken up on a toothpick and smeared upon the heated slide. If necessary, the slide is reheated at intervals until the material adheres in an even film. A grease pencil mark is drawn across about half an inch from one end of the slide, which is again heated by passing through the flame. The phenolfuchsin is now dropped upon the preparation. If the slide has been properly heated, steaming will occur upon the addition of the fuchsin and further heating is unnecessary. Allow the fuchsin to stain for a few minutes and rinse in tap water. With a dropper apply 15 or 20 drops of blue-acid-alcohol and allow to remain for about half a minute. Rinse in water and repeat the blue-acid-alcohol treatment until a blue preparation is obtained. This usually requires three or four applications. The blue-acid-alcohol is prepared by dissolving 2.5 grams of analin blue (W) in 1 liter of alcohol containing 3 per cent of hydrochloric acid. I have used this method in many hundred instances and can recommend it as giving the very best results as well as saving considerable time.

Distribution of tubercle bacilli in the sputa of tuberculous patients.

	White corpuscles.				Total.
	Less than 10,000.	Over 10,000 and under 12,000.	Over 12,000 and under 15,000.	Over 15,000.	
Total number of cases.....	72	100	149	103	424
Cases showing tubercle bacilli.....	23	49	104	83	259
Cases positive:					
First examination.....	20	39	89	80	228
Second examination.....	2	4	7		13
Third examination.....	1	1	2	1	5
Fourth examination.....			2 e		2
Fifth examination.....		2 b, f	1 e		3
Sixth examination.....			1 c		1
Seventh examination.....		1 e		1 b	2
Eighth examination.....		1 f ?	1 e ?		2
Ninth examination.....					
Tenth examination.....		1 e	1 f	1 f ?	3
Per cent of positive cases detected first examination...	87	80	85	96	88
Per cent of positive cases detected first three examinations.....	100	90	94	97	95
Number of positive cases not detected after first three examinations.....		5	6	2	13
Positive cases not detected in three examinations but which later showed numerous, or moderately numerous, bacilli.....		4	5	1	10

U. S. NAVAL MEDICAL SCHOOL LABORATORIES.

Additions to the Helminthological collection, United States Naval Medical School, December, 1911-February, 1912.

Accession No.	Name.	Host.	Collected by or received from—
19816	<i>Tænia saginata</i> (adult).....	<i>Homo</i>	Dr. C. A. Pfender, Washington, D. C.
19817	<i>Tænia saginata</i> (ova).....	do.....	Do.
19818	<i>Trichinella spiralis</i> (embryo).....	White rat, tongue.....	L. Avery, Naval Medical School.
19819	do.....	White rat, muscles.....	Do.
19820	<i>Paragonimus</i> (adult in cyst).....	<i>Homo</i>	Surg. E. R. Stitt, Philippines.
19821	<i>Paragonimus</i> (adult).....	do.....	Do.
19822	<i>Necator americanus</i> (adult).....	do.....	Naval Medical School.
19823	<i>Trichuris trichiura</i> (adult).....	do.....	Do.
19824	<i>Trichinella spiralis</i> (adults).....	White rat, intestine.....	L. Avery, Naval Medical School.
19825	<i>Ascaris lumbricoides</i> (adult).....	<i>Homo</i>	Surg. Grove, Naval Hospital, Washington, D. C.
19826	<i>Hymenolepis diminuta</i>	White rat.....	Garrison and Avery, Naval Medical School.
19827	<i>Trichinella spiralis</i> (embryoes).....	White rat, in muscles.....	Do.
19828	<i>Hymenolepis diminuta</i> (ova).....	White rat.....	Do.
19829	<i>Trichinella spiralis</i> (adults).....	White rat, in intestine.....	Do.
19830	<i>Trichinella spiralis</i> (embryoes).....	White rat, in muscles.....	Do.
19831	<i>Hymenolepis diminuta</i> (ova).....	White rat, in intestine.....	Do.
19832	<i>Hymenolepis diminuta</i>	do.....	Do.
19833	<i>Trichinella spiralis</i> (adults).....	do.....	L. Avery, Naval Medical School.
19834	<i>Hymenolepis nana</i> (adults).....	do.....	Do.

Additions to the pathological collection, United States Naval Medical School, December, 1911-February, 1912.

Accession No.	Tissue.	Diagnosis.	Collected by or received from—
618	Aorta, descending.....	Aneurysm.....	U. S. S. Solace.
619	Peyer's patches.....	Typhoid.....	Do.
620	Brain.....	Abscess.....	Do.
621	Pancreas.....	Pancreatitis, acute hemorrhagic.	Do.
622	Lower lip.....	Epithelioma.....	C. M. Oman, Naval Hospital, New York.
623	Venereal sore from prepuce.....	Chancre.....	J. J. Snyder, U. S. S. Michigan.
624	do.....	do.....	Do.
625	Spleen.....	Benign amyloid degeneration.....	C. M. Oman, Naval Hospital, New York.
626	Liver.....	Atrophic cirrhosis with fatty infiltration	Do.
627	Tumor from nose.....	Endotheliosarcoma.....	Do.
628	Blood.....	Spleno-myelogenous leukemia.	Naval Medical School.
629	do.....	Anemia.....	Do.
630	do.....	Pernicious anemia.....	Dr. A. W. Balch, Washington, D. C.
631	do.....	do.....	Do.
632	do.....	Malaria, tertian.....	Do.
633	do.....	do.....	Do.
634	do.....	Malaria, estivoautumnal.....	Do.
635	do.....	do.....	Do.
636	do.....	Malaria, tertian.....	Do.
637	do.....	Malaria, tertian "benign".....	Do.
638	do.....	Malaria, tertian.....	E. O. J. Eyttinge.

Additions to the pathological collection, United States Naval Medical School, December, 1911-February, 1912—Continued.

Accession No.	Tissue.	Diagnosis.	Collected by or received from—
639	Blood	Malaria, tertian, double infection.	Newport Hospital.
640	do.	Malaria, tertian	Do.
641	do.	do.	Do.
642	do.	do.	Do.
643	do.	Malaria, quartan	Do.
644	do.	do.	Do.
645	do.	do.	Do.
646	Pancreas	Degenerative changes	C. M. Oman, Naval Hospital, New York.
647	Liver	Thickening of capsule, degeneration.	Do.
648	Kidney	Interstitial nephritis	Do.
649	Blood	Pernicious anemia	Do.
650	Liver	Perihepatitis, chronic	E. R. Stitt, Naval Hospital, Cavite, P. I.
651	Cholera tissue .....	.....	Do.
652	Leprosy tissues .....	.....	E. R. Stitt, Bureau of Science Manila, P. I.
653	Glanders tissues .....	.....	E. R. Stitt, Philippine Medical School.
654	Medulla	Miliary tuberculosis	E. R. Stitt, Naval Hospital, Cavite, P. I.
655	Spleen	do.	Do.
656	Diaphragm	do.	Do.
657	Intestine	do.	Do.
659	Liver	Acute yellow atrophy	Do.
660	do.	Syphilitic	Surg. Butler.
661	Lung .....	.....	Do.
662	Lymph gland	Metastatic carcinoma	Do.
663	Chondroma .....	.....	Do.
664	Liver of dog	Acute passive congestion	Washington, D. C.
665	Lung	Broncho-pneumonia	Do.
666	Liver	Cirrhosis	Do.
668	Bladder, guinea pig, endothelioma.	Normal	Do.
669	Blood smears	<i>Spirochæta obermeyer</i>	Do.
670	Smears	<i>Smegma bacilli</i>	Do.
671	do.	Bovine tuberculosis	Do.
672	do.	<i>Gonococcus</i>	Do.
673	do.	Duprey's bacillus	Do.
674	Blood	<i>Spirochaetes</i>	Do.
675	Smears	<i>Bacillus pestis</i>	Surg. E. R. Stitt.
676	Nasal tissue	Sarcoma	C. M. Oman, Naval Hospital, New York.
677	Heart muscle .....	.....	P. A. Surg. W. L. Irvine Guantanamo.
678	Kidney .....	.....	Do.
679	Liver .....	.....	Do.
680	Pancreas .....	.....	Do.
681	Thrombus .....	.....	Do.
682	Lung .....	.....	Do.
683	Tumor from buttock	Fibroma	Surg. C. M. Oman, Naval Hospital, New York.
684	Clavicle	Necrosis following abscess	Do.
685	?	.....	Surg. Spear, Naval Hospital, Washington, D. C.
686	Tumor from male turkey	Malignant (?)	E. W. Phillips, Santa Cruz, Cuba.
687	Sections from rabbit	Lead poisoning	E. R. Stitt, Naval Medical School.
688	Tumor from greater trochanter .....	.....	C. M. Oman, Naval Hospital, New York.
689	Section of tumor from nose .....	.....	Do.
690	Spleen surrounded by normal pancreas.	Tubercular	Do.
691	Liver	Abscess	Do.
692	Blood	Lymphatic leukemia	Do.
693	do.	Estivo-autumnal malaria	Do.
694	do.	Tertian malaria	Do.
695	do.	Normal and miscellaneous	Do.
696	Slides	Amœba	Do.
697	Blood	<i>Spirochaetes</i>	Do.
698	do.	Leucocytosis, mononuclear	Do.
699	Pleuritic fluid sediment .....	.....	Do.
700	Blood	Gangosa	Do.
701	Pancreas	<i>Ascaris lumbricoides</i> in duct	W. M. Kerr, Guam.
702	Appendices .....	.....	C. M. Oman, Naval Hospital New York.

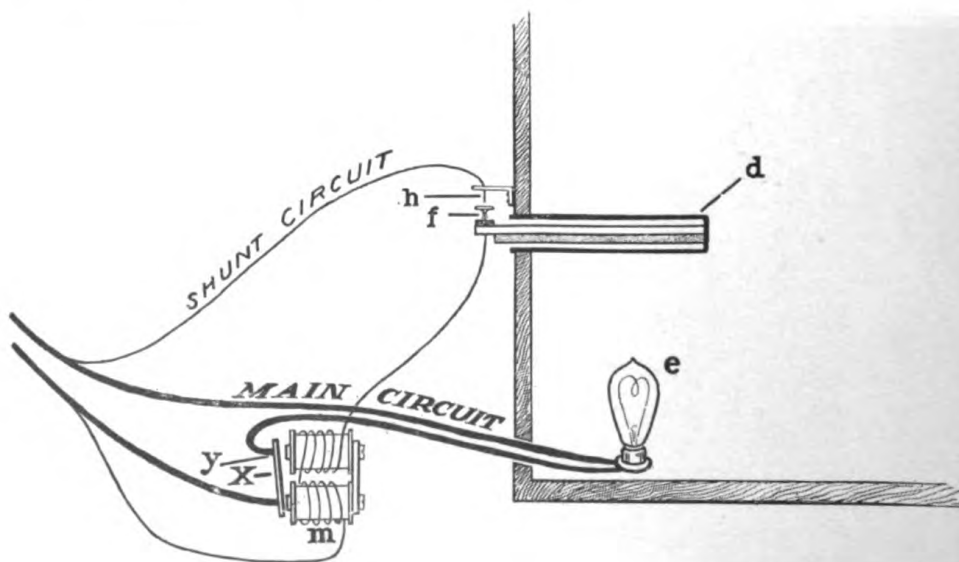
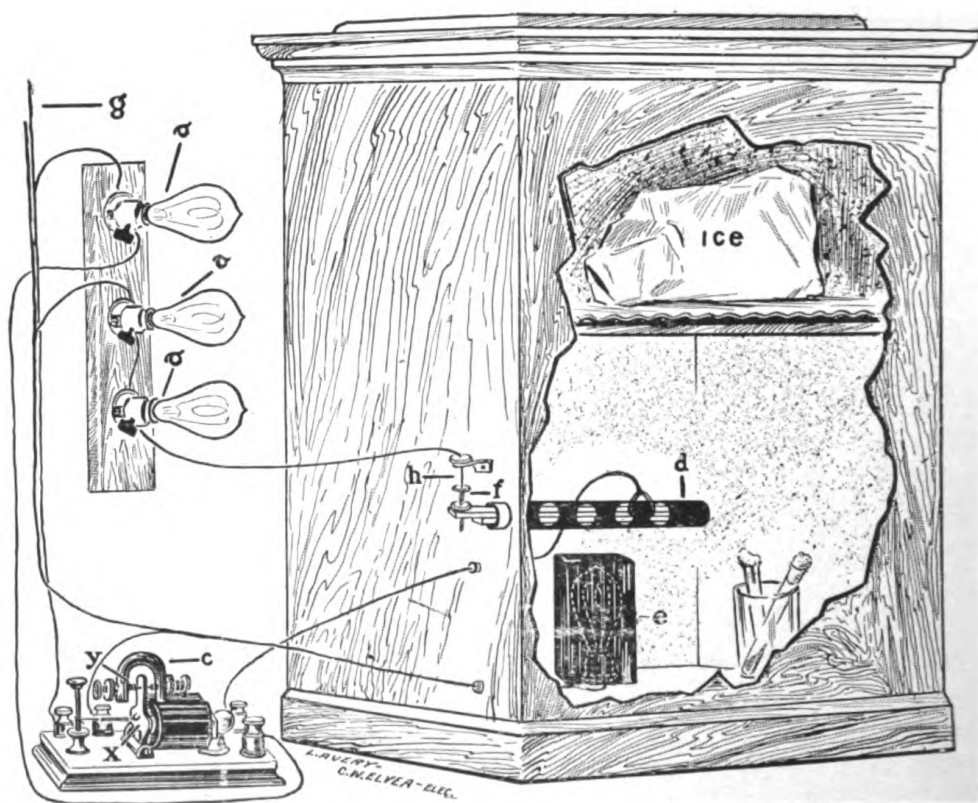
Additions to the pathological collection, United States Naval Medical School, December, 1911-February, 1912—Continued.

Accession No.	Tissue.	Diagnosis.	Collected by or received from—
703	Mammary gland.....	Carcinoma, scirrhus.....	R. S. Spear.
704	Liver.....	<i>Treponema pallidum</i>	Dr. Butler.
705	Venereal sore from prepuce.....		Naval Hospital, Washington, D. C.
706	Section from prepuce.....		Dr. Halsey.
707	Lung, liver, spleen, and kidney.....		Dr. Butler.
708	Eye.....		Dr. Shipp.
709	Section of intestine.....	Diverticula.....	Dr. Butler.
710	Rabbit blood.....	Lead poisoning.....	Do.
711	Blood.....	Pernicious anemia.....	Dr. Huff.
712	Sections through eye.....		Naval Hospital, New York.
713	Abdominal tumor.....	Adeno-carcinoma.....	Naval Hospital, Philadelphia, Pa.
714	Superior alveolar ridge.....		C. M. Oman, Naval Hospital, New York.
715	Bone marrow.....		U. S. S. West Virginia.
716	Autopsy sections.....		C. M. Oman, Naval Hospital, New York.
717	Gland, inguinal.....		B. H. Dorsey, Naval Hospital, Chelsea, Mass.
718	Liver.....		Medical officer, U. S. S. West Virginia.
719	Spleen.....		Do.
720	Pancreas.....		Do.
721	Kidney.....		Do.
722	Spinal cord.....		Do.

About 50 of these additions are specimens on hand before the present catalogue was begun which have been classified and catalogued since last report.

Miscellaneous collection, United States Naval Medical School, December, 1911-February, 1912.

Accession No.	Name.	Locality.	Collected by or received from.
1	<i>Anopheles</i> (adults).....		
2	<i>Anopheles</i> (adults, pupæ and larvæ).....		
3	<i>Culex</i> (larvæ, pupæ, eggs, and viscera).....		
4	<i>Culex</i> (larvæ).....		
5	<i>Stegomyia</i> (adult, pupæ, larvæ).....		
6	<i>Cimex lectularius</i> (common bedbug).....		
7	Ticks (adult).....		
8	Ticks (larvæ).....		
9	<i>Pediculus</i>		
10	Fleas.....		
11	<i>Dermatophilus penetrans</i>		
12	<i>Ctenocephalus canis</i>	San Francisco, Cal.	Collection of Carroll Fox.
13	<i>Ceratophyllus sexdentatus</i>	San Francisco, Cal. (wood rat's nest).	Do.
14	<i>Ceratophyllus niger</i>	Fruitvale, Cal. (sparrow's nest).	Do.
15	<i>Ceratophyllus telchinum</i>	California (<i>Microtus californicus</i>).	Do.
16	<i>Hoplopsyllus cassinis</i>	San Francisco, Cal. (<i>Lepus bachmani</i>)	Do.
17	<i>Hoplopsyllus anomalous</i>	(<i>Citellus beecheyi</i>)	Do.
18	<i>C. acutus</i>	do.	Do.
19	<i>C. franciscani</i>		Do.
20	<i>Stegomyia calopus</i> and <i>Stegomyia scutellaris</i>	Hawaii.....	Dr. O. J. Mink.
21	Scorpion.....		Found in marine's clothes.
22	Coral snake (<i>Elaps fulvius</i>).....		
23	Tarantulas.....	Porto Rico.....	Dr. Stalnaker.
24	Centipede.....	do.	Do.
25	Tropical arthropods, crustaceans, echinoderms.....	do.	Do.
26	Copperhead snake.....	District of Columbia.....	A. E. Ebeling.
27	Tamagás snakes.....	Bluefields, Guatemala.....	Dr. Thornton.



SUGGESTED DEVICES.

AN INCUBATOR FOR GELATINE CULTURES.

By Hosp. Steward F. L. LERRS, United States Navy.

This incubator, which consists of an ordinary refrigerator adapted to its present use, was devised by Passed Asst. Surg. O. J. Mink, and Hosp. Apprentice, first class, C. W. Elyea, United States Navy, and is the first satisfactory result of numerous attempts made at the Naval Medical School to secure a constant 20° C. incubator. It has now been in use for over a year, and in that time has seldom varied more than a degree from 20° C., the temperature to which it is adjusted and which is used here as the optimum for obtaining characteristic growths and actions (liquefying) of bacteria on gelatine media. In the problem of making the heat of the incubator chamber automatically regulate itself it was found that where an electric current is used as the source of heat it can be controlled by the interposition of a sensitive thermostat and a good electromagnet.

The accompanying figure shows the general arrangement of the apparatus. The lower compartment of the refrigerator is used as the incubator chamber. The heat necessary is given out by a 16-candlepower incandescent lamp, over which is a shade made by covering a test-tube basket with dark paper. Ice is used to insure a temperature below that of the laboratory in which the incubator is placed.

The parts indicated are:

e. A 16-candlepower incandescent electric lamp placed in the incubator chamber as the source of heat.

g. Electric feed wire, 110 v., D. C.

c. An ordinary "pony relay" instrument.

d. A bimetallic thermostat made by soldering together strips of two metals having different coefficients of expansion and then soldering the composite bar to the bottom of a stout brass tube. Thus it will be seen that when differential expansion causes the composite bar to bend, its fulcrum is at the bottom of the tube and its free end has a maximum of motion. Through the double wall of the incubator a hole is bored just large enough to hold the tube firmly in a horizontal position. In the present case the thermostat is turned so that the metal having the greater coefficient of expansion is below. Therefore heat will cause the free end to move upward and cold will bend it downward.

f. A milled head screw working in the end of the thermostat bar. A piece of platinum sunk into the upper surface of this screw furnishes one of the contact points of the shunt circuit. The screw is used also to adjust the distance between these contact

points and thus set the temperature at which the thermostat bar will rise high enough to close the shunt circuit. The larger the gap the higher the temperature required.

h. A contact point made by twisting a piece of platinum wire onto the copper wire of the circuit. This must be insulated from the thermostat.

m. The electromagnet of the relay instrument.

x. Armature of *m*.

y. The contact point against which *x* is held by a spring when no current is passing through the coils of the magnet.

a.a.a. Incandescent lamps used as a rheostat in the shunt circuit. Since the electromagnet consists of a very large number of turns of wire around soft iron cores, a very weak current suffices to make it a powerful magnet. But when the main circuit is broken and the full strength of the current passes through the shunt, it tends to heat the coils of the magnet and also to fuse the contact points at the time of opening or closing the circuit. Sufficient lamps were put on this rheostat to bring their incandescence down to a faint glow.

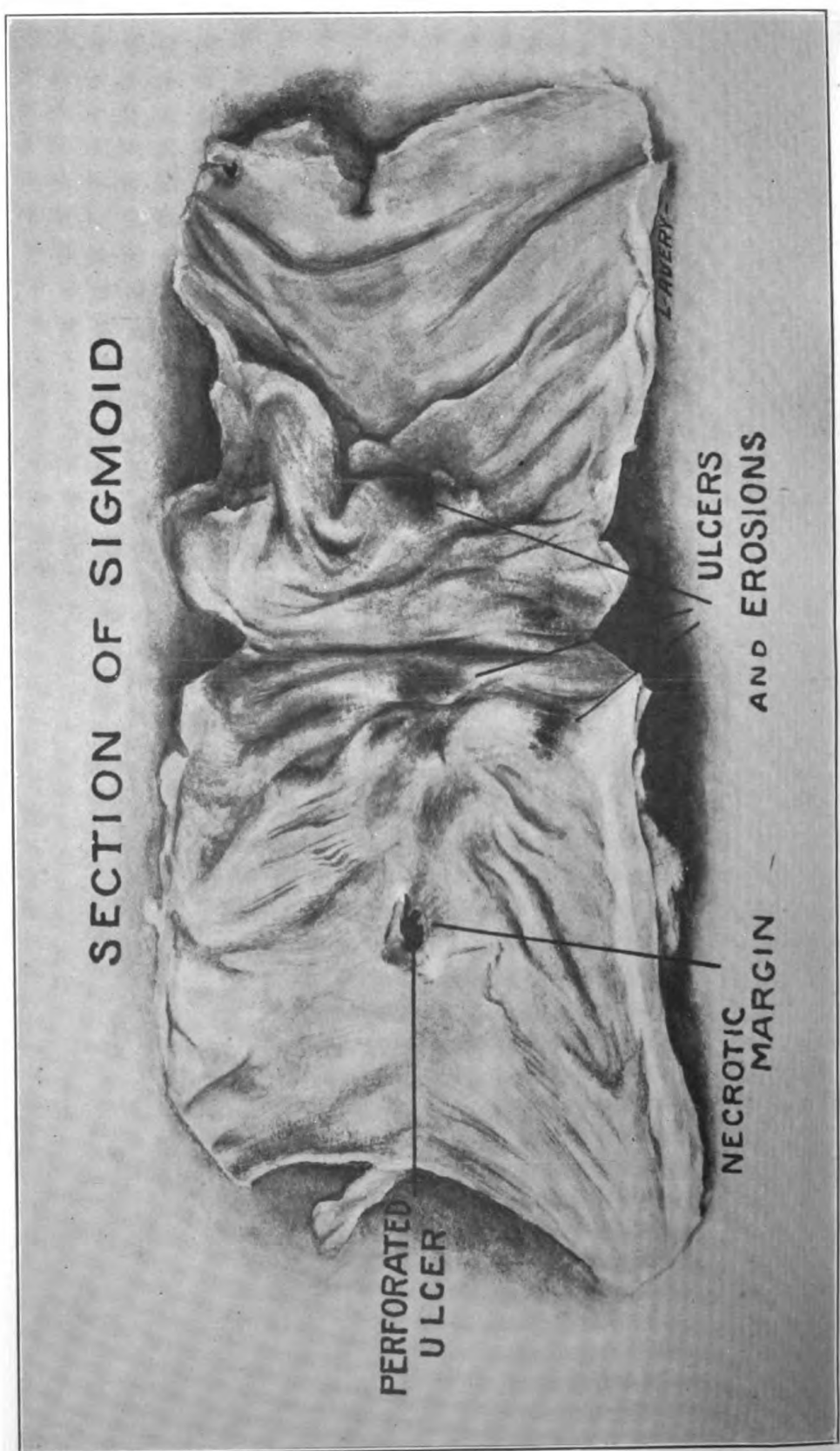
The principle upon which the heat is controlled is best indicated in the lower diagram.

The main-circuit wire is cut and the ends attached to the binding posts connected with *x* and *y*. Thus a "make and break" is provided for the current to the lamp *e*, the source of heat.

In order that the heat of the incubator may control this "make and break," a shunt circuit is spliced onto the main circuit and the electromagnet *m* connected to the contact points at *h* and *f*. The connection at *f* may be directly to the screw or to any convenient part of the thermostat. *h* is held firmly above *f* by means of a small bracket attached to the incubator.

When the temperature of the incubator rises above 20° C., the thermostat bar raises *f* to contact with *h*. The shunt circuit is closed. A small part of the current overflows into it and passes through the coils of the magnet. *x* is drawn away from *y* and the current to the lamp broken. As the incubator cools, the thermostat bar bends downward, drawing *f* away from *h*. The shunt circuit is broken, the magnet demagnetized, and the armature flies back to contact with *y*, thereby renewing the current to the lamp in the incubator.

The accompanying drawings were made by Hosp. Apprentice, first class, L. Avery, United States Navy.



CLINICAL NOTES.

REPORT OF A CASE OF PERFORATION OF THE SIGMOID BY AN ULCER IN A CASE OF DYSENTERY (FLEXNER-STRONG).

By Surg. RAYMOND SPEAR and Passed Asst. Surg. M. E. HIGGINS, United States Navy.

The patient, Mrs. W., age 48, had resided in Washington, D. C., for a number of years, and, so far as known, had not been in contact with any case of dysentery. Previous history had no bearing on case.

For three weeks before admission to hospital, had been treated by a doctor for supposed typhoid fever. When first seen condition was desperate, was very septic; was running temperature between 103° and 104°. There was a large mass in pelvis involving uterus, left tube and ovary, and signs of a spreading peritonitis: White count remained in the neighborhood of 20,000.

Three days after admission abdomen was opened and a large quantity of pus was evacuated, the left ovary and tube with uterus, which were all involved in the inflammatory process, were removed, and the abdomen was drained through the vagina, and also through the median incision. The intestines that were in the inflammatory zone were covered with thick purulent exudate. No perforation was discovered at this time.

A portion of the exudate was placed in a tube of sterile bouillon and incubated for 18 hours. A nonmotile gram negative organism having the cultural characteristics of *B. dysenteriae* (Flexner-Strong) was present in pure culture. This organism was agglutinated by the patient's serum in a dilution of 1 to 200 in 30 minutes.

One week after operation fecal material discharged from the wound. The patient gradually became weaker from toxic absorption, and died two weeks after operation.

At autopsy, the colon was found to be studded with numerous small ulcers and eroded areas, averaging from 3 to 7 millimeters in diameter. The base of some of the ulcers was formed by peritoneum. One ulcer in the sigmoid had perforated. There was no pus in the abdomen and no general peritonitis.

Sections of the perforated ulcer showed areas of necrosis, and practically no inflammatory infiltration.

This case is of interest, in that there was no history of dysentery, and ulcerations are not the rule in infections due to *B. dysenteriae*.

Evidently the organism which was isolated from the general peritoneal cavity reached it through a small perforation which

occurred at some time previous to admission to the hospital, and bore a definite relation to the ulcerations of the colon, as indicated by the agglutinating property of the patient's serum.

NOTE.—The illustration is from the drawing made from the original specimen, by Hosp. Apprentice L. Avery, United States Navy, and shows clearly the ulcer which perforated, surrounded by a small necrotic area, and several erosions.

PLASTIC OPERATION OF LIP.

By Surgeon ROBERT A. BACHMANN, United States Navy.

I. C., a mess attendant was sent to the hospital at his own request to see if the excess of lip tissue which was a continual source of embarrassment to him, could be helped by an operation.

As the correction of such a deformity seemed quite possible, he was assured that some improvement, at any rate, could be expected.

The anesthetic was rather difficult, and it was found best to work between intervals of ether administration.

An incision, resembling a double ellipse, was made, each ellipse including the most prominent portion of each side of the upper lip. The incision was deepened until a sufficient section of tissue was removed. Bleeding at this point was considerable and difficult to control, as too many hemostats interfered with the progress of the operation.

The upper lip was stitched together, several tension sutures being placed deeply, then the mucous membrane was coapted by silk sutures. A great many of these, 32, I believe, were used to secure accuracy and neatness in the line of incision. As more tissue was used from the oral surface of the lip than the facial, this line of sutures was drawn well out of sight to the undersurface.

As the improvement was so great after the upper lip had been operated upon it was considered unnecessary to proceed with the lower.

The wound healed nicely. Practically no scar resulted, the lip maintained its normal contour, and when the patient was discharged he returned to the hospital to tell me that former shipmates of his failed to recognize him.

REMOVAL OF ENTIRE FIBULA.

By Passed Asst. Surg. JOHN L. NEILSON, United States Navy.

B. K., gunner's mate, third class, was first admitted to the sick list on July 24, 1905, with the diagnosis of myalgia acuta. The symptoms consisted of pain, swelling, redness, and tenderness of the right foot,



BEFORE OPERATION.



AFTER OPERATION

ankle, and leg, more marked over the external malleolus than elsewhere. Spasm of muscles was marked, and the slightest motion gave rise to intense pain. Temperature was 101° F. No history of traumatism could be obtained, and there was no evidence of gonorrhœal infection. The patient was transferred to the naval hospital, Newport, R. I., on July 26, where treatment by rest, elevation, bichloride dressings, and salicylates was inaugurated.

On July 27, as the condition was much worse, a 4-inch incision was made, upward from the tip of the malleolus, over the fibula. Pus was evacuated and denuded bone found, and on July 29 the incision was extended 3 inches, necrotic periosteum removed, and the wound packed with iodoform gauze. At this time the diagnosis was changed to periostitis. (There is no record of smears or cultures having been made at this time.)

There was considerable diminution in swelling following these two operations, but on July 31 an area of redness and fluctuation appeared 2 inches below the head of the fibula, which was incised, pus evacuated, cavity irrigated with bichloride solution, and iodoform gauze used as packing. Immediately, improvement was marked.

On August 3 acute synovitis of the left knee joint developed, progressing rapidly to redness, swelling, and fluctuation, so that on August 6 an incision was made opening up the knee joint and evacuating considerable pus. Smears from this pus and that from the right leg showed only staphylococci. At this time the patient's general condition was at a very low ebb. Bed sores had developed, the temperature showed septic absorption, and he suffered severely and continuously; was unable to sleep, and partook of little nourishment.

On August 25 the sinus below the head of the fibula in the right leg was laid open, and a large amount of pus evacuated. Following this last operation there was a long period of alternate progress and retrogression, but the tendency was toward improvement, so that on November 27 he was able to be about the ward a little on crutches. During this time potassium iodide had been used conscientiously without effect other than the production of gastric irritation.

On December 10, 1905, when I first saw the patient he was pale, emaciated, and weak. There was no evening rise of temperature. Considerable pain was experienced in the right leg after being in an erect position for a short time. The left knee was in good condition. The sinus had healed and motion was nearly normal, limited only by about 5° of extension. The right knee could be extended only to an angle of 30°. The sinuses at the head of the fibula and at the malleolus were healed. A dense mass of scar tissue extended from the middle third of the leg to the malleolus in the center of which was a small discharging opening, connecting with sinuses leading upward and downward to indeterminate distances. Small

necrotic fragments of bone were removed. The whole leg was swollen and tender.

On December 11, an incision was made through the sinus in the scar tissue extending 2 inches above and below. Necrotic bone was removed by curetting and it was found that the entire circumference was involved. The incision was gradually extended both upward and downward until the full length of the fibula was exposed. The head, an area at the junction of the upper and middle thirds, and the whole lower half of the bone, including the malleolus, was spongy and necrotic. The periosteum on the outer aspect was destroyed, and swollen and necrotic on the inner. There was no evidence of new bone formation. The entire fibula was removed, leaving the healthiest periosteum in hopes that there might be some regeneration. The cavity was cleansed and the muscles, scar tissue, and skin approximated, leaving drainage over the former position of the malleolus. The knee was forcibly straightened and the entire member placed in a splint. (Incidentally, a sebaceous cyst, which caused the patient much worry, was removed from the cheek.) Subsequently it was necessary to open the wound at the top and in the middle to drain small collections of pus, probably due to the necrosis of the periosteum that was left.

The patient's general condition improved rapidly. Under passive and active motion the knee joint limbered up remarkably. The three drainage wounds closed in order from above downward, and by March, 1906, the lower one was entirely healed.

When discharged from the service by approved recommendation of a board of medical survey on March 20, 1906, there was no tenderness or pain. The wound was solid. The left knee had normal motion, and the right one nearly so. The muscles of the right leg were markedly atrophied, and there was absolute toe drop. The patient could walk without the aid of crutches.

On February 3, 1912, this man appeared for reenlistment. He stated that his ankle had bothered him for some months after his discharge from the hospital, but that this had passed and his leg had gradually grown stronger. He had obtained an appointment as postal clerk in an active post office and had held the position easily. He had run, played ball, and carried on the usual pursuits and pleasures of society without difficulty, and, in fact, had grown to "forget his leg." Examination showed fairly developed calf muscles; perfect active and passive motion in right ankle and both knees, and a condition of good physical and mental health. He was enlisted on February 3, 1912, and hoped to advance through the various grades of the gunner's branch.

An X-ray photograph taken at the time of his reenlistment showed that there had been no regeneration of bone.

**FRONTAL SINUSITIS, FOLLOWED BY DOUBLE MASTOIDITIS.
OPERATIONS.**

By Passed Asst. Surg. GEORGE B. TRIBLE, United States Navy.

The following case is of interest, not for the rarity of any one factor, but from the associated conditions. It illustrates very clearly the interrelationship existing between infections of the nose and accessory sinuses and the middle ear and the mode that infection is conveyed by contiguity of mucous membrane.

Case N.—C. M. A. A., readmitted to the Naval Hospital, Norfolk, Va., February, 1911, from the United States Army and Navy General Hospital, Hot Springs, Ark., where he had been under treatment for three months for rheumatism.

Because of headache, pain over right brow, and difficulty in breathing through the right nostril, he was referred to the special-treatment ward in May, 1911, where he gave the following history bearing on the symptoms mentioned.

In May, 1906, he first noticed headache and pain over right side of forehead, which had persisted at irregular intervals since that date. About this time there was also an interference with breathing on the right side, and he would awaken in the morning with a dry throat. He was treated for nasal obstruction on board the U. S. S. *Connecticut* and later in the United States Naval Hospital, New York, during the winter 1907-8. He also went to a specialist in civil practice. He was quite deaf in the left ear following gun fire in the Philippines in 1909.

Examination showed large masses of polypoid tissue in the right nostril; the anterior end of the right middle turbinate was large and bulging. Posterior rhinoscopic examination showed pus in the right middle meatus. This pus came from either the frontal sinus or the anterior ethmoid cells, or both. Hearing, right ear 13/15, left ear deaf to rough tests.

Polypi removed with a Krause snare and Luc cutting forceps. On June 13, 1911, a modified Kilian operation was performed. The right frontal sinus was filled with pus and granulations; ethmoid was broken into and also contained pus. The anterior end of the right middle turbinate had been previously removed under cocaine. Profuse discharge of pus followed, with free drainage.

During July, 1911, there occurred an acute otitis media (suppurative), with a later complicating mastoiditis on the left side. A simple mastoid operation, with opening of the antrum, was performed. Recovery of the operation wound and cessation of all discharge took place in about 21 days. Before the first wound was healed he contracted an autoinfection in his right ear with an acute mastoiditis complicating. A simple mastoid and opening of the antrum was

performed October 10, 1911. Recovery in this instance took about five weeks.

The only organisms present in the pus were the staphylococcus pyogenes aureus and a few streptococci. It is interesting to note that the rheumatism cleared up almost entirely following free drainage and evacuation of the pus. This tends to bear out the German doggerel: "Was man nicht erkennet, das er Rheumatismus nennet." "What one does not recognize, that he calls rheumatism."

SALVARSAN IN SYPHILIS, LEPROSY, AND YAWS.

By Asst. Surg. W. M. KERR, United States Navy.

A supply of salvarsan was received at the United States Naval Hospital, Island of Guam, Marianas, in June, 1911, and it is thought that a report of 11 cases in which this preparation was used would be of interest.

It was found that the various methods described for making a clear solution of salvarsan were unsatisfactory for some unknown reason, in Guam, and the following method was devised: The drug was placed in a sterile 100 cubic centimeter flask and 60 cubic centimeters of hot, sterile, distilled water were added. With slight agitation the salvarsan was dissolved, and a clear, orange-colored acid solution resulted. To this solution 4 cubic centimeters of a sterile decinormal solution of sodium hydroxide were added, with the production of a precipitate. From a sterile, 2 cubic centimeter pipette, decinormal sodium hydroxide was added drop by drop until the solution became clear. Twelve drops was the amount required (using the same pipette each time). This resulted in a solution neutral or slightly alkaline to litmus. The content of the 100 cubic centimeter flask was filtered through sterile filter paper and sufficient sterile, distilled water was added through the filter to make 300 cubic centimeters of salvarsan solution, which was the amount injected. It was found that the distilled water as supplied by the distilling plant in Guam is practically isotonic, which probably is the cause of the failure to secure a clear solution by means of methods which are successful elsewhere.

Case 1.—W. R. V., private, United States Marine Corps, aged 20, contracted syphilis in Japan about June 5, 1911. A small chancre appeared on the penis early in July. About August 1, he noticed a copper-colored symmetrical rash on the face, chest, arms, and legs. This rash did not itch. Following this he had some sore throat, fever, and headache. He reported at sick call August 24, 1911, and presented a fading, secondary rash, mucous patches in the mouth, and general glandular enlargement. Treatment was withheld until a rabbit was immunized for the Wassermann test. On September 7 the Wassermann reaction was found to be positive and 0.6 gram of salvarsan was given intravenously. He had a slight temperature reaction (101° F.) and felt nauseated for about two hours after the administration of the drug. On September 8, the rash had practically disappeared and the mucous patches in the mouth were gone. The following day the skin was clear. On September 12, the Wassermann reaction was still

positive. On September 20, it was weakly positive (10 per cent of hæmolysis). On October 1 and 4, the reaction was strongly negative. On October 12, the reaction was slightly positive, and on November 2, strongly positive. This was taken as an indication that another dose of salvarsan should be given. This was done November 3, with the result that on November 15, the serum reaction was negative. Shortly after the administration of the drug the patient had a severe chill of about 15 minutes duration and a rise of temperature to 100° F., which continued for three hours.

The above case was the only one of primary syphilis in Guam, but as leprosy is said by Noguchi to give a positive serum reaction in a majority of cases it was thought that the new preparation might have some effect on the reaction as occurring in this disease. Salvarsan is a protoplasmic poison and it was not expected to have any effect on the bacillus of leprosy. Observations made after the administration of the drug supported this premise and also showed that one dose of salvarsan at least has no effect on the serum reaction; but that the lesions of a case of gangosa and one of yaws were remarkably affected.

The serum reactions were determined by Asst. Surg. E. P. Halton, United States Navy, who employed Noguchi's modification of Wassermann's technique.

Case 2.—A. T., Chamorro, leper, nodular type, aged 48. This patient showed complete loss of the nose and a large ulceration extending from the nasal cavity out over the left cheek. The tissue surrounding this ulceration, in which no lepra bacilli were found, was so greatly infiltrated that the left eye was completely closed. The base of the ulcer presented yellow, pale granulations and exuded foul, watery pus. On his chest and legs were numerous scars of former ulcerations. These lesions were considered due to gangosa, which the patient had developed prior to leprosy. The Wassermann reaction was positive. On September 16, 1911, 0.6 gram of salvarsan was given intravenously. No unpleasant reaction occurred beyond a slight rise of temperature. He was next seen on September 18, when the ulceration was found to be half its original size and clean, with red, healing granulations on its base. The induration in the surrounding tissue was gone and the eye was opened. On September 20, the ulceration was completely healed, its site being marked by a red scar. On October 7, and on November 2, the Wassermann reaction was still positive, but the scar had shrunk to a narrow white line of cicatricial tissue. No change was noted in the leprosy condition.

Case 3.—Chamorro, leper, maculo-anaesthetic type, aged 38. This patient had a large, ulcerating yaws papule on the right side of the chest. The Wassermann reaction on September 13, 1911, was positive. On September 15, he was given 0.6 gram of salvarsan intravenously. A slight temperature reaction followed. He was next seen on September 18. The papule had disappeared and in its place was a small ulceration surrounded by a dry, scaly area the size of the base of the former papule. The following day the small ulceration was healed. On September 24, there remained only a small scar to mark the place of the former papule. On October 7, and again on November 2, the Wassermann reaction was strongly positive.

The succeeding seven cases may be described together, as the conditions and results were identical:

Case 4.—V. P. R., Chamorro, leper, nodular type, age 34.

Case 5.—A. A., Chamorro, leper, maculo-anæst. type, age 31.

Case 6.—J. H. T., Chamorro, leper, maculo-anæst. type, age 60.

Case 7.—J. T., Chamorro, leper, maculo-anaes. type, age 38.

Case 8.—J. B. D., Chamorro, leper, maculo-anaes. type, age 51.

Case 9.—J. C. Q., Chamorro, leper, mixed type, age 24.

Case 10.—J. C. D., Chamorro, leper, mixed type, age 31.

On September 13, 1911, the serum reactions of the above cases were positive. On September 15, each was given a dose of 0.6 gram of salvarsan intravenously. No unpleasant reaction followed beyond a slight rise in temperature and a feeling of general malaise, lasting about 24 hours, which occurred in case 5, and a severe chill, lasting about 15 minutes, which occurred in case 7 immediately after the administration of the drug. On October 7, the serum reaction of all cases was still positive. On November 2, the reaction was again determined with the result that it was found to be strongly positive. No change occurred in the leprosy lesions, although case 4 thinks his general condition has improved since the drug was given.

Case 11.—V. de la C., Chamorro (female), leper, mixed type, age 48. On September 15, 1911, the Wassermann reaction was strongly positive. A dose of 0.2 gram of salvarsan was given intravenously. During the operation, and for an hour afterwards, there was intense pain in the arm extending from the site of injection to the shoulder, where it was particularly intense. A slight febrile reaction lasting for 24 hours followed. On October 7, the Wassermann reaction was still strongly positive. No change in the leprosy condition resulted.

TWO SURGICAL CASES OCCURRING ON THE U. S. S. SOUTH CAROLINA. (SANITARY REPORT, 1911.)

By SURG. R. B. WILLIAMS, United States Navy.

CASE 1.—*Abscess of prostate; gangrene of scrotum, pyæmia, death.*

W. A. B., fireman first class, United States Navy. Admitted June 20, 1911, at which time there was fever and repeated chills. Examination showed marked bulging of the perineum and œdema of scrotum and penis. A large amount of pus was evacuated by perineal incision; finger in wound revealed very large cavity in prostate; prostate almost completely destroyed; drainage tube inserted.

Subsequent course of disease: Gangrene and sloughing of entire scrotum, exposing testicles; steady increase of respiratory rate; almost negative pulmonary findings; occasional chills, leucocytosis; death July 4, 1911. Post mortem: A great number of small abscesses scattered throughout the substance of both lungs.

It will be noted that the dissemination of the infection by septic emboli occurred in the systemic and not in the portal circulation, although portal involvement so frequently occurs in perirectal infections. In this connection the report of Segond, that of 114 cases of large prostatic abscess the mortality amounted to 34 cases, is interesting.

CASE 2.—*Tonsillitis, tonsillectomy, acute nephritis, uremia.*

K. A. S., ordinary seaman, United States Navy, was admitted July 7, with the usual signs and symptoms of an acute tonsillitis. The right tonsil was much enlarged. By July 18, the acute symptoms had subsided, and on this date the right tonsil was removed with

tonsillotomy. Usual convalescence did not occur; marked pallor and vomiting developed. On July 28, the urine was found to be loaded with albumen (many granular and hyaline casts microscopically). On August 2, marked uremic symptoms manifested themselves (convulsions followed by coma, suppression of urine). On August 5, patient was transferred to hospital. It has subsequently been learned that complete recovery occurred.

Nephritis following tonsillitis is not a medical curiosity, but is certainly not common. In this case the etiological factor was very evident.

SURGICAL CASES FROM THE NAVAL HOSPITAL, NORFOLK, VA.

By Surg. H. F. STRINE, United States Navy.

Lucerated left kidney with severe hemorrhage. Nephrectomy.

F. H. D., electrician, second class, United States Navy. About 3 p. m., September 4, 1911, while riding a motor cycle in a race, traveling about 40 miles an hour, lost his balance and collided with a telegraph pole, striking his left side over spleen and kidney region. He was found unconscious and transferred to the United States Naval Hospital, Norfolk, Va.

Upon admission, at 6 p. m., his temperature was 97° F., pulse 100, respiration 30. Coughing up bloody, frothy sputum; large contusion over left side of chest and abdomen; abdomen distended, rigid, and left side dull on percussion. Catheter withdrew 200 cubic centimeters of bloody urine.

Within one hour his condition became critical. Pulse very rapid, weak, and intermittent. It was evident from the blood in the urine that the left kidney was injured; also, from the bloody sputum, that the left lung had been penetrated by a fractured rib; but the location of the contusion, the abdominal signs, and the severe progressive symptoms of hemorrhage suggested a ruptured spleen.

He was etherized and the peritoneal cavity opened by a high, left, through-rectus incision. To facilitate description, the nature and extent of the injuries received are given at this point.

The second, sixth, tenth, eleventh, and twelfth ribs were fractured; the tenth, eleventh, and twelfth were observed during the operation; the second, sixth, and ninth presented callous knots after convalescence. The twelfth rib was driven into the kidney. The spleen, strange to say, escaped injury. The hemorrhage from the kidney was severe, the pressure sufficient to separate the peritoneum from the diaphragm and to surround the stomach with blood except for a small area, and to force it between the layers of the mesentery and mesocolon, thus causing them to appear as large hematomas. Only about one-third of the circumference of the transverse colon, opposite

the attachment of the mesocolon, remained normal with peritoneal covering intact.

On opening the peritoneal cavity, free blood escaped which had entered by a rent in the peritoneum, caused by one of the floating ribs. The upper abdominal organs were identified with difficulty, as they appeared as hematomas. Two large masses, the first believed to be the spleen and the second a ruptured pancreas, were large blood clots behind the peritoneum. Both were exposed and an immense quantity of clotted blood removed. The hemorrhage was now traced to its source, the kidney, which was brought into view through the external layer of the mesocolon. The upper half of the kidney was crushed. Nephrectomy was performed, all blood clots removed, and the wound closed with a small gauze drain.

The patient's condition at this time was alarming from loss of blood and shock. Saline solution was given intravenously and Murphy's proctoclysis continued during the night. Twenty-four hours later 800 cubic centimeters of urine were voided. Blood pressure was 140 millimeters; intestinal paresis and abdominal distension were marked; pulse 130. Forty-eight hours later 2,100 cubic centimeters of urine were voided. Blood pressure was now 145 millimeters and there was enormous distension. Sixty-four hours later signs of returning peristalsis appeared, and from this time convalescence was uneventful, except that the patient was quite uncomfortable for the first two weeks on account of the fractured ribs. Blood pressure returned to normal and remained under 120 millimeters until he left the hospital. He was discharged to duty at the wireless station October 20, 1911, since which time he has been performing his duty. He was last seen January 24, 1912, riding a motor cycle and apparently in good health.

Gastroenterostomy.

During the year two gastroenterostomies were performed. In both cases the posterior suture method (Mayo's) was followed.

Case 1.—J. F. C., water tender, United States Navy, age 49. A history of chronic gastritis extending over a period of more than five years, with repeated attacks of hematemesis, was obtained. Readmitted January 13, 1911. His general condition was such that death was expected during the first 24 hours, and he was expelling large quantities of "coffee-ground" vomitus. Physical signs: Stomach enlarged and very tender on palpation. On January 18, his condition had improved to such an extent that operative treatment was considered advisable. Gastroenterostomy was performed. His stomach, from nonmalignant mechanical obstruction at the pylorus, was dilated, and several groups of adhesions were observed showing peritoneal involvement from old calloused ulcers. Conva-

cence was uneventful. Patient was discharged to duty February 13, 1911, since which time he has been performing his duties in charge of a navy-yard tug. He was last seen in December, 1911, apparently in good health, and stated that he was able to "eat any kind of food without indigestion."

Case 2.—J. M., chief gunner's mate, United States Navy. Patient was readmitted February 2, 1911, with choleangitis. There was a history of epigastric pain more or less constant, but with acute exacerbations several hours after dinner, lasting the greater part of the night. He was fairly well nourished. On physical examination both recti muscles were found on guard above the umbilicus. Tenderness was exquisite on deep pressure over the region of the duodenum. No definite history of blood in vomitus or stools could be obtained. Gastric analysis showed marked hyperacidity. On March 14, 1911, the peritoneal cavity was opened by a high, left through-rectus incision. The gall bladder and its appendages were found to be normal, and apparently the stomach also. The first part of the duodenum presented a densely indurated area from ulceration, narrowing the lumen. Posterior gastroenterostomy was performed and convalescence was uneventful. Patient was discharged to duty April 22, 1911, without symptoms and in good health.

NOTE.—Two distinct plans of post-operative treatment were followed in these cases. Case 1: Saline proctoclysis 2,000 cubic centimeters each, 24 hours for 5 days and nourishment by rectum. Fowler's position. His only complaint was annoying thirst and craving for food after the second day. No vomiting. Case 2: No proctoclysis and no nutritive enemas. Fowler's position. Water on the second day and liquid nourishment on the third day by mouth. Patient was quite comfortable. No vomiting.

Cholecystocolostomy. External biliary fistula, stricture of the common duct.

A. J., boatswain's mate, first class, United States Navy. Operation, January 31, 1911. There was a biliary fistula following cholecystotomy, performed November 7, 1910. Efforts to discontinue drainage were followed by constitutional symptoms showing complete blocking of the common duct. He was gradually losing weight under the constant drain and the long absence of bile from the intestinal tract. It was urgent that the bile stream should be returned to the alimentary canal through the natural passage if possible, if not by an anastomosis.

Under ether the peritoneal cavity was opened internal to the fistula, through the right rectus. The ducts were so massed in dense adhesions and the stenosis was of so long standing that it was decided to join the gall bladder to the intestine. The transverse colon just beyond the hepatic flexure was the most accessible point. After

freeing the gall bladder from the abdominal wall an anastomosis was made with a small Murphy button. The fistulous opening was excised and the wound closed.

Fifty-four hours following the operation his temperature remained under 100° F., pulse fair, but there was persistent nausea, severe pain, and he appeared toxic. There was no evidence of bile passing into the colon, and under the belief that the communication was at fault and a rupture imminent, the wound was reopened and an exploration made. The anastomosis was found well walled off by recent adhesions and the gall bladder empty behind the button. The wound was closed with drainage. Convalescence for the first 10 days was stormy, and the manipulation of the anastomosis during the exploration resulted in a fecal fistula that later closed spontaneously. The button was passed the sixth day. During the first month there was a tendency to diarrhea, and free bile appeared in the stools. After convalescence was established free bile only appeared in the stools after the administration of calomel or a brisk cathartic.

The patient was discharged to duty April 26, 1911. When last seen, in December, 1911, he was serving on board ship, and stated that he felt perfectly well; there had been no jaundice. That his service had been satisfactory is evinced by the fact that he had been promoted to chief boatswain.

Comment.—It is recognized that this operation is seldom indicated. However, the history and record of this case led to the belief that the primary stenosis was inflammatory in character. A failure to recognize the fact that suppression of bile sometimes occurs after operations upon the liver or its appendages led to the exploratory operation, which events proved was unnecessary.

Multiple abscess of the liver. Pure staphylococcus infection probably secondary to a small post-auricular furuncle.

B. A. C., coxswain, United States Navy, age, 22. Admitted to this hospital March 21, 1911, with typhoid fever. He had never been in the Tropics, and there was no history of dysentery. His health was excellent prior to March 1, when present illness began with pain in the region of the liver, radiating to the right shoulder, and accompanied by remittent fever.

His clinical chart suggested typhoid fever, but this disease was excluded by a negative Widal, a high leucocyte count (20,000), and a tender mass, apparently in front of the right kidney. The liver was not enlarged to percussion. Perirenal or a high appendix abscess was suspected. On March 23, an exploratory laparotomy was performed by a high incision through the outer border of the right rectus. The anterior border of the liver appeared normal at the free border of the ribs. The appendix was normal. The mass was

posterior to the hepatic flexure of the colon and believed to be a perirenal abscess.

The abdominal wall was closed and an incision made posterior. The tumor when exposed was liver tissue behind the peritoneum. The kidney was depressed and the colon pushed forward, a multilocular abscess was located by a large needle, pure staphylococcus pus was evacuated, and the cavity drained.

Much improvement in his general condition was noticed the first week. However, this was only temporary, and the remittent fever and high leucocyte count returned. The right lobe of the liver, April 21, extended $2\frac{1}{2}$ inches below the free border of the ribs and was extremely tender to pressure. It was exposed by a transperitoneal incision, the abscess located, and about 1,000 cubic centimeters of pus (staphylococcus) evacuated.

Comment.—The clinical chart up to the first operation was typical of typhoid. The pain was at no time severe, and its radiation to the shoulder disappeared early in the disease. There were no chills or sweats during this period, and the liver was not enlarged anteriorly. The diagnosis of abscess was simple at the time of admission to the hospital, based on the physical signs and a high leucocyte count. The location, however, was not so apparent. The abscess was multilocular for the reason that it was attacked early. The liver tissue had not completely broken down. Discharged to duty July 30, 1911, having gained 40 pounds in weight.

EDITORIAL COMMENT.

YELLOW FEVER ON THE YORKTOWN.

The recent outbreak of yellow fever on the *Yorktown*, during which eight cases occurred, with two deaths, including that of the commanding officer, has attracted widespread attention in the public press, and there seems to be general appreciation of the fact that infection was due to local conditions beyond the Navy's control. Sanitary conditions on shipboard to-day would be almost perfect if it were not for contamination from shore, a possibility which military necessity sometimes renders unavoidable.

The sanitary conditions at certain South American ports, as indicated by Public Health Reports and those of the sanitary department of the Isthmian Canal Commission, are, and long have been, deplorable. Fortunately, the approaching opening of the Panama Canal has brought this question into general prominence, and it can not be doubted but that a situation which constitutes a grave menace to the welfare of this Nation and the shipping of the world demands, and will receive, adequate consideration by the countries immediately concerned.

The report by Asst. Surg. Camerer, of the *Yorktown*, published in part elsewhere in this issue, serves well to illustrate some of the difficulties and responsibilities the naval medical officer may at any time be called upon to confront.

The situation on the *Yorktown* put a very grave and urgent responsibility on the medical department of that vessel, not in any sense on humanitarian grounds, but on the score of military duty. The presence of the ship was demanded by reason of military necessity. Had ineffective or vacillating methods been employed, or had there been a lack of sympathy, lack of wise coordination and cooperation, contagion might have become so widespread as to have utterly defeated the possibility of carrying out the duty assigned the ship by the Department.

Medical officers should center their attention on so-called occupational and industrial hygiene of the Navy, a field almost untouched, one which promises to add very materially to the fighting efficiency of the fleet. Painstaking care and conscientiousness in meeting their daily humanitarian responsibilities will better fit them to avert the disabilities that now threaten military efficiency in many directions.—
(C. F. STOKES, SURGEON GENERAL, U. S. NAVY.)

THE NAVAL MEDICAL BULLETIN.

This issue of the Bulletin marks its fifth anniversary. From a small pamphlet of some 50 pages, it long since reached a maximum size limited primarily by the expense of publication. Fortunately there is reason to believe that it has developed correspondingly in value and influence, as evidenced by the favorable notices of its special articles in medical literature, both at home and abroad, and a steadily increased demand for the publication itself, which the Bureau is quite unable to supply.

Devoted to the dissemination of highly specialized information, not generally accessible elsewhere, the Bulletin embraces a professional field in many respects unique. In the accomplishment of its aims, it is evident that such a publication could not be dependent upon the efforts of any single group of individuals in Washington or elsewhere, though the conscientious work of the special collaborators, who have so cheerfully accepted these tasks, "in addition to their other duties," may not be generally understood.

Happily the Bulletin has never lacked support; from its inception the publication has been looked upon as a cooperative enterprise in which all members of the Medical Department are equally shareholders, alike concerned in its welfare, and taking an individual pride in its progress. The value of this unity of purpose is fully appreciated, and comments and suggestions submitted with a view to bettering the Bulletin or increasing its usefulness are always welcomed.

Minor changes in makeup, introduced with this issue, have been adopted in conformity with current practice, while the caption on the cover was deemed too restricted in scope. The Bulletin is not "limited to professional matters as observed by medical officers," but, as correctly stated in the preface, "information received from all sources will be used"; as an instance, it may be stated that the publication of a valuable article on the ventilation of warships, written by a naval constructor, is contemplated for an early issue.

In connection with this anniversary, it would seem particularly appropriate to give due acknowledgment to the efforts of former editors, whose painstaking and unselfish work has done so much to insure the success of the Bulletin. The officers who have been engaged in these duties are as follows: Surg. W. H. Bell, Surg. C. N. Fiske, Surg. J. C. Pryor, and Passed Asst. Surg. R. W. McDowell.

HOSPITAL SHIPS.

The utilization of vessels of this class is receiving increased attention abroad. Recent articles by British and German naval officers indicate awakened interest in these countries, while the Italian Government has been actively employing such ships during the present war with Turkey.

Fleet Surg. D. J. P. McNabb, Royal Navy,¹ considers the ideal hospital ship to be a vessel of 3,000 to 4,000 tons, with a speed of about 12 knots per hour and accommodations for some 240 sick in peace and 340 in war. It would seem, however, that a vessel of this size would be too small to adequately provide for so many patients; an allowance of 15 tons per bed for a fully equipped hospital ship is not deemed excessive, according to our ideas, while a speed of 12 knots seems much too low for a vessel designed to accompany a modern fleet. It appears that, in general, the views of Fleet Surg. McNabb are indorsed by the British Admiralty, as, according to current report, a hospital ship is to be built and completed by June, 1913. It is said that the vessel will be of 5,000 tons displacement, hence, somewhat larger than the one proposed above, with accommodations for from 260 to 330 patients, and carrying especially equipped motor boats for their transfer. Turbines will be used "and the speed will be limited to 12 or 14 knots, in order to avoid vibration," perhaps a costly sacrifice. The principal medical officer will be of fleet surgeon's rank. A captain (master?) and crew, as in the *Maine*, will be drawn from the merchant service.

According to the German view, as expressed by Marine Oberstabsarzt Dr. zur Verth,² the ideal hospital ship is a vessel of 5,000 tons displacement, 124 meters long, 15.3 meters beam, and a coal capacity of 900 tons; such a vessel is designed to have a total capacity of 270 beds, 20 of these being for contagious cases. Dr. zur Verth is of the opinion that two vessels of approximately 250 beds each are of greater value than a single ship of double the size. Owing to the higher sick rate on tropical stations, he would provide one ship for each division, while in home waters the same facilities would be adequate for an entire squadron.

The above remarks apply to fully equipped hospital ships, but it appears that he contemplates the use during war of additional hospital transports. He calls attention to the admirable practice of the Japanese Government in so supervising the construction of certain merchant vessels as to render them well adapted to conversion into hospital transports.

At the beginning of hostilities between Italy and Turkey the Italian navy department fitted up two emigrant steamers as ambulance ships, namely, the *Re d'Italia* (3,982 net tons) and the *Regina d'Italia* (3,398 net tons). In addition to the above, the Italian Red Cross Society equipped the merchant steamer *Memfi*. This vessel was chartered by the Italian Government in the same manner as other transports, and the Red Cross Society furnished the stores, medicines, doctors, nurses, etc. On board this vessel there were 17 ladies of Italian noble families and the Duchess of Aosta, who acted as nurses.

¹ Functions of Hospital Ships. Jour. Roy. Army M. C., Vol. XVIII, No. 2.

² The Hospital Ship. Marine-Rundschau, July, 1911.

The Knights of Malta have a large depot of medical supplies at Rome with which they fitted up the *Regina Margherita* (1,981 net tons) under the same conditions as the Red Cross ship. The hospital staff, consisting of 6 doctors, 1 pharmacist, 40 male nurses, and 10 female nurses (nuns), was also supplied by the society. On this ship the beds for enlisted men, 250 in number, are simply those which are carried normally for the emigrant service. There are also 50 rooms for officers, a dispensary, main operating room, 2 dressing rooms, disinfecting plant, and bacteriological and microscopical rooms.

It is of particular interest to note that the time required to fit up each of these ships was about five days, as the permanent beds already installed for emigrants were utilized. It was therefore only necessary to disinfect the ships, knock down some few bulkheads, and get the stores and personnel on board. These vessels, however, are purely ambulance ships, used for transporting the sick and wounded from Tripolitania and Cyrenaica to some of the large hospitals in southern Italy and Sicily and were only intended to care for patients during the short time required to make the trip—that is, from two to five days.

Lieut. Commander N. Leonardi, Royal Italian Naval Reserve,¹ gives an interesting account of the operations of these vessels. The Italian navy had designated beforehand, from some of the finest ships of the merchant marine, those which were best fitted to satisfy the requirements, a special board had decided what changes were necessary, and all the bedding and medical stores which were to be put on board at a given moment were ready in the departmental hospitals. Owing to these preparations, the *Re d'Italia* was able to reach Tripoli before the arrival of the expeditionary corps.

This ship and the *Regina d'Italia* had each accommodations for 500 wounded, a number which in exceptional circumstances could be increased to 600. The ships at all times provided their own means for embarking and landing the sick and wounded.

On October 24 and 25, the first wounded began to be embarked, and on the following day the wounded came directly from the field throughout the battle. Embarkation was carried out in the following manner: There were two parties, with surgeons, hospital corpsmen, and naval and merchant seamen. In each whaleboat were eight wheeled stretchers for eight wounded. As a general rule, however, only one boat was reserved for the transport of these cases, the other boat being used for the less seriously wounded who were able to walk. The patients were swung on board the hospital ship in cots similar to our Navy sick-bay cot, slung from a bar and properly guyed. It is stated that with these arrangements it was possible to take on board the wounded at the rate of one man per minute through each hatch.

¹ *Revista Nautica*, February, 1912.

On the first trip to Palermo the *Regina d'Italia* landed in only two hours 220 wounded and 110 sick, and this was followed by another trip, when 220 sick and wounded were carried from Tripoli to Naples. Upon this latter occasion the ship lay for many days in quarantine. Altogether this vessel had transported 1,049 sick and wounded.

It thus appears that while these were naval hospital ships, their services up to date have been principally in caring for the sick and wounded of the army, as the operations in this campaign have been almost entirely on land.

PARESIS AND "LINE OF DUTY."

Passed Asst. Surg. Heber Butts, in his "Further observations on the insane of the Navy," published in this issue, reopens the old question of "line of duty" in connection with paresis and certain other affectionps of the nervous system. Accepting the dictum, "Without syphilis there can be no paresis," the writer expresses the opinion that cases of this disease must necessarily be considered as originating "not in the line of duty," except, of course, those following syphilis insontium.

But even if we admit that syphilis is an indispensable element in all cases of paresis, it must still be conceded that some other factor is also essential, as a very small percentage of syphilitics become paretic. To prove that this unknown factor is never incident to service conditions requires an immense amount of negative evidence and, indeed, is hardly susceptible of demonstration as yet.

From inquiries made at the Pension Bureau regarding the current rulings on this question, it appears that there must be a definite history of syphilis to warrant an adverse finding, and each individual case is judged on its merits. It would seem that this conservative view may be consistently followed in the Navy, at least in the light of present knowledge.

PROGRESS IN MEDICAL SCIENCES.

GENERAL MEDICINE.

Surg. A. W. DUNBAR and Passed Asst. Surg. J. L. NEILSON, United States Navy.

ANDERSON, J. F., director, hygienic laboratory, and Joseph Goldberger, passed assistant surgeon, United States Public Health and Marine-Hospital Service. The relation of so-called Brill's disease to typhus fever. Public Health Reports, February 2, 1912.

In previous issues of the Bulletin reviews from various sources on Brill's disease have appeared. The demonstration of the relationship of this disease to tabardillo (Mexican typhus fever) as reported by these investigators and their conclusion that Brill's disease is a mild form of typhus fever of European origin, is a matter of great importance to medical officers of the naval service, especially to those at the recruit depots.

The conclusions reached are as follows:

1. The rhesus monkey is susceptible to infection by inoculation with the blood from a case of Brill's disease.
2. One attack of the disease in the monkey induces a definite immunity to a subsequent infection with virulent blood of the same strain.
3. Monkeys recovered from an infection with Brill's disease have been found to be immune to a subsequent infection with virulent blood from a case of Mexican typhus fever.
4. Monkeys recovered from an infection with Mexican typhus fever have been found to be immune to a subsequent infection with Brill's disease.
5. From the above results we conclude that the disease described by Brill is identical with the typhus fever of Mexico, and inasmuch as the New York strain is undoubtedly of European origin we may also conclude that the typhus of Europe and the tabardillo of Mexico are identical.
6. If this conclusion is correct, typhus fever has been present in New York City for a number of years, and, according to verbal reports made to us, has occurred in other large cities of the United States.
7. These results make the clinical recognition and study of typhus fever of increased importance and necessitates the exercise of appropriate prophylactic measures.
8. It is not intended to exaggerate the menace of this disease to the public health. Nevertheless, although the disease in New York City has apparently been mild and has shown little tendency to spread, it is apparently on the increase there, and the possibility should be borne in mind that it may acquire virulence and epidemic prevalence.—(A. W. D.)

BARTLETT, W. B., M. D. **The Diagnostic Importance of Hemoptysis.** Boston Medical and Surgical Journal, December 21, 1911.

Leftwich gives 41 causes of hemoptysis, many of which are from unimportant sources easily determined by direct examination of the

nose, mouth, throat, and upper air passages. From the larynx it may be due to syphilis, tuberculosis, cancer, or lodgment of a foreign body, also from severe coughing in acute laryngitis. From the trachea or bronchi from the impaction of a foreign body, pressure of a tumor, enlarged bronchial glands, aneurysm, or local varicosities. Coming from the lungs the hemorrhage may be due to certain constitutional diseases, as purpura, hemophilia, severe jaundice, leukemia, anemia, hemorrhagic examthemata, typhoid fever, and pernicious anemia. In arthritic cases over 50 years of age hemorrhage from the lungs occurs, which is probably due to a local endarteritis, and is not followed by pulmonary changes.

Aside from tuberculosis, valvular heart disease is the most frequent cause of hemoptysis. In acute engorgement of the lungs the blood is red and frothy. An hypertrophy of the right ventricle, as occurs in chronic nephritis may cause fatal hemorrhage from the pulmonary arteries. It is most frequent in mitral stenosis and also occurs in mitral regurgitation, the condition being frequently diagnosed as tuberculosis, while as a fact tuberculosis is infrequent in mitral disease. Embolism and infarct may cause repeated hemorrhages. Hemoptysis due to aneurysm may be small and frequent or large and fatal.

Hemoptysis occurs in 30 to 80 per cent of cases of pulmonary tuberculosis, and the tendency to recurrence is strong. It is the initial symptom in many cases, and occasionally the only one present. It also occurs in bronchiectasis, abscess of the lung, cancer, hydatids, aspergillosis or syphilis of the lung, acute pneumonia, asthma, bronchitis, and emphysema. Lord reports chronic influenza as a cause of repeated hemorrhages. Of miscellaneous and, in this country, rare causes are noted epidemic hemoptysis, due to a lung fluke (*Paragonimus westermani*), of which Fox reports two cases in the United States. Hay reports one case due to angio-neurotic edema, and Carballo also one due to filariasis. Vicarious menstruation is by many authorities assigned as a cause, but it is probable that all these cases have a tubercular basis.

Hemoptysis occurring in young and apparently healthy persons without warning may pass off without further symptoms of tuberculosis, but these cases are as a rule due to tuberculosis. Overexertion may produce a hemorrhage from the lungs, but as a rule 90 per cent of all cases of hemoptysis are due to tuberculosis.—(A. W. D.)

FUSSELL, M. H., M. D. Acute dilatation of the stomach in pneumonia. American Journal of Medical Science, December, 1911.

The writer invites attention to this generally unrecognized complication or sequel of pneumonia and reports five cases from his own practice and six from other sources.

The stomach is extremely enlarged, and every case autopsied showed a constriction of the duodenum at the root of the mesentery. That the condition is acute, and not the symptoms alone, is shown by the return of the stomach, in most cases, to its normal size after the dilatation is relieved.

The dilatation in pneumonic cases is probably secondary to a toxic condition, affecting the innervation causing dilatation which by traction produces a constriction of the duodenum. In three out of the five cases reported by the writer recovery ensued rapidly after use of the lavage tube. Of the six other cases reported four died, the lavage tube not being used, while in the two cases in which the stomach was washed out recovery ensued.

Symptoms are (a) vomiting, painless in character in about 90 per cent of the cases, the vomitus being yellowish, greenish, or blackish in color, feculent at times and usually in quantity; (b) pain in about 50 per cent of the cases; (c) abdominal distention marked and occurring rapidly; (d) collapse; (e) constipation; (f) succussion sounds.

This condition is to be differentiated from general peritonitis, pancreatic cyst, uremia and acute hemorrhagic pancreatitis.

The death rate in this condition generally is 62 to 72 per cent, but is probably largely due to delayed diagnosis and improper treatment, as the cases reported above show a rate of but 55 per cent.

The treatment, the success of which is largely dependent upon early recognition of the condition, is lavage of the stomach repeated if distention recurs. The patient should be placed on the right side. Food and drink should be interdicted. Eserine and strychnia are of value.—(A. W. D.)

ALBERT, H., M. D., and MENDENHALL, A. M., M. D. **Reaction induced by anti-typhoid vaccination.** American Journal of the Medical Sciences, February, 1912.

The authors give a brief sketch of the history of artificial immunization against typhoid fever. It was first tried on lower animals, the earlier experimenters being Simmons and Fränkel (1886), Beumer, Chantemesse, Widal, and Sanarelli. In 1892 Brieger, Kitasato, and Wassermann determined that the use of killed typhoid bacilli was quite as efficient in inducing the production of antibodies as were living bacteria. Pfeiffer's work in 1893 demonstrating the possibility of inducing marked bacteriolysis in the body and the work of Grubler and Durham in 1896 on agglutinins was a great stimulus to further research. In 1896, Pfeiffer and Kolle, working together, and A. E. Wright, independently, inoculated two men with typhoid vaccines. In 1897 Wright reported the inoculation of 18 persons and in 1898 introduced typhoid inoculation on a large scale among English soldiers in the Boer War. Unfavorable results in Africa caused a partial suspension of the work for a few years. In 1904, upon the

advice of R. Koch, it was introduced into the German Army, and a little later into the English Army through the efforts of Col. Leishman. In 1908 it was introduced in the United States Army, the vaccination being voluntary until 1911, when it became compulsory.

Wright's statistics on the Boer War show 19,069 soldiers inoculated and 150,231 not inoculated. The vaccination reduced the incidence of the disease 50 per cent and the mortality 75 per cent. These inoculations consisted of one injection. Leishman, in a recent report, states that the number of cases of typhoid and deaths from that disease were about one-tenth as high among those vaccinated (5,373 persons) as among those not vaccinated (6,610 persons).

The authors in their work used the vaccine as prepared and issued by the Army Medical School. (Cultivation of nonvirulent strain of typhoid bacilli on agar slants for 18 hours, then making a suspension of the growth in sterile salt solution and diluting so that one cubic centimeter contained 1,000,000,000 bacilli. This suspension then sterilized at 56° C. for one hour, tested by aërobic and anaërobic cultivation and injection into animals, and sealed by heat in sterile glass ampoules after addition of trikresol to make a 0.25 per cent solution.) They used three subcutaneous injections in the arm at 10-day intervals, the first dose consisting of 500,000,000 and the other two of 1,000,000,000 bacilli.

The reaction is local and systemic. Local reaction comes on in from four to five hours and gradually subsides in from three to five days. It consists of a reddened, tender, and swollen area about 10 centimeters in diameter. Systemic reaction begins about five to six hours after inoculation and disappears in about 48 hours or less. One or more of the following symptoms were observed: Pyrexia (up to 103° F.), headache, malaise, insomnia, nausea, and in rare instances backache, vomiting, chills, herpes, loss of weight, and albuminuria. Reactions become progressively less with each succeeding injection. The mild character of the reactions is evidenced by the fact that of 30,000 injections in the United States Army there were no general reactions, or only mild ones, in 95 per cent, consisting of headache, malaise with slight rise of temperature, and that there were no untoward results. One of the authors' cases who had had typhoid fever nine years previously had a severe reaction, and Russel reports more severe reaction in those who had previously had the disease.

From their observations the authors found that antityphoid vaccination causes a marked increase in the specific agglutinins, opsonins, and bacteriolysins. That it causes a marked polymorphonuclear neutrophile and large mononuclear leucocytosis. (The degree of leucocytosis was highest after the first injection and reached its height in about six hours. The large mononuclear leucocytosis persisted after the total count had dropped to normal.) That this increase

(both absolute and relative) of the large mononuclear leucocytes in the peripheral blood is the only leucocytic change which is common to both clinical typhoid fever and antityphoid immunity, and is the important element to be considered.—(J. L. N.)

SURGERY.

Surg. R. SPEAR and Surg. C. M. OMAN, United States Navy.

JOHN, Dr. MARINE-OBERSTABSARZT, Kiel. **Organization of the medical service at the main dressing station in battle.** Meinungsaustausch. Marine-Rundschau, June, 1911, page 771.

In the January number of the Bulletin, on page 110, Dr. zur Verth's paper "On organization of the medical service at the main dressing station during a battle" was reviewed. This paper gave a very lucid account of what has been termed the humanitarian view of the medical officers' function during a battle at sea. We therefore welcome in the present paper by Dr. John an equally clear and interesting expression of opinion on the military side of the same function.

The opinion has been held for some years and been repeatedly expressed by some of the naval medical officers on this side of the Atlantic, namely, that there is a decided military aspect in the functions of the medical officers' activity in connection with a battle at sea on board. But the question as to whether this military point of view is justified can only be settled by furnishing satisfactory proof of the fact that the naval medical officer can and does in reality contribute something very substantial toward winning a battle, and, moreover, if such undoubted proof can actually be brought forward the military point of the whole question will, according to Dr. John, constitute the only and exclusively correct point from which to view the medical officer's function during a battle at sea.

We have, then, in the above-mentioned two papers, both from the pens of experienced naval surgeons, the two representative opinions expressed in clear and unmistakable terms and so decidedly as to give one the impression that both opinions can no longer coexist and that the one will, finally, have to yield precedence to the other, while a definite decision between the two must be of fundamental importance to all of us.

According to Dr. John, it is self-evident that during a battle of relatively short duration and over a limited area, but of the most far-reaching importance in its consequences, as is every battle at sea, it is absolutely imperative to utilize every available means calculated to contribute something toward winning victory. The professional activity of the medical officer in battle is limited to minimizing the effect of the enemy's projectiles on the ship's complement of men and consists, therefore, in lending aid to the removal of one

of the most important causes of disturbance in the ship's operations and capacities for giving battle. The projectiles of the enemy interfere with the ship's capacity for giving battle in two ways, namely, (1) by diminishing the number of fighting men and (2) by influencing psychically the uninjured men through the presence of the dead and severely wounded. A well-organized transportation service, provided for during peace maneuvers, takes care of the latter cause of disturbance.

Because of the greater vulnerability of men than of guns there will sooner or later be more guns on board than men to man them. From the military point of view it becomes of great importance that every slightly wounded man be placed in a condition to return to his post of duty with the greatest promptness, even if this must be done at the expense of the severely wounded who, from the humanitarian point of view, would seem to have a prior claim on the services of the medical officer. Dr. John accordingly deems it necessary that the ship's physician take charge of the receiving station, because of his being less likely to be guided by the serious character of the injured person than would a surgeon with less experience in the demands of the moment. He holds it even as equivalent to a higher grade of humanity to thus contribute toward victory than giving aid to injured individuals under such circumstances. Victory by your vessel will, he says, result in benefit to all the wounded on board at once, while its loss in battle may mean the sinking of even the best and most carefully cared for, seriously wounded, and all because of the failure of the lightly wounded not having been returned, as they should have been, to their stations, in order to resume their activity in the normal and orderly progress of the battle. The regular ship's physician, with the necessary experience acquired at sea and under sea conditions, is the best fitted to take charge of the receiving station and to make the proper selection demanded by the exigencies of the hour.

Furthermore, with regard to the question of precedence for giving surgical assistance to the injured during battle a prompt discrimination between the individual importance of injured persons in the organization must receive adequate consideration. The commander in chief of the organization, if wounded, would call for immediate assistance at the place of injury by the ship's surgeon, and so down the list.

In the various efforts that have been made to compare military and naval battle conditions Dr. John would admonish us to use great caution, and Dr. zur Verth in his paper has likewise called attention to certain very weighty points of difference existing between the two services. To this list of differences Dr. John adds the following:

1. The duties of the naval surgeon at the battle dressing station are much more comprehensive than are those of the Army surgeon.

2. The surgeons of the Army are, in accordance with the articles of the Geneva convention, noncombatants, whereby the lines of their activity are determined and within the limits of which they may, therefore, perform their duties with all the corresponding greater freedom. The above designation when applied to naval surgeons would have nothing whatever to do with the "noncombatants" of the Geneva convention. Naval surgeons have neither the rights nor the duties of such, but constitute in their active work of aiding in the removal of the most important disturbing agents in battle, pronounced actual combatants, so that Dr. John would consider it a grave error to give captured naval surgeons, with the exception of those from hospital ships, their freedom.

3. The duties of the individual soldiers in a troop are much more alike and uniform than are those among the men on board of a man-of-war, where there exists a much greater variety of distinct and highly developed specialists and representing different duties and functions. The fighting value of a ship is, therefore, not necessarily to be determined, as in the Army, by the mere number of men lost in battle. There is a distinct medical factor involved in this question.

4. The losses in a troop of soldiers may be made good by reserves from another troop. A warship will, on the contrary, have to reckon with its original equipment of men, and with this we touch upon another important point of medical cooperation with a military end.—
(MEDICAL DIRECTOR H. G. BEYER, U. S. NAVY.)

RICHARDSON, MAURICE H. *The error of overlooking ureteral or renal stones under the diagnosis of appendicitis.* *Annals of Surgery*, February, 1912.

The author in looking backward over several thousand operations for appendicitis has come to the conclusion that appendicitis per se is not always so easy to diagnose.

The histories of a number of cases are cited in detail showing the difficulties at times in arriving at a correct diagnosis. In one case in which the viscera were transposed, a previous operation was abandoned, for the operator could not find the appendix. Search on the left side by Richardson was rewarded by finding the cæcum and appendix.

Cases of salpingitis, ovarian tumor with twisted pedicle, tuberculosis of cæcum, psoas abscess, perforation of the stomach or duodenum, malignant disease of the intestines, and gall bladder disease have all been mistaken for appendicitis and vice versa.

The surgeon is confronted by the greatest possible variety of abdominal pain, especially in women. Without pain of some sort at some time a diagnosis of chronic appendicitis is impossible. It is conceivable that an infection of the appendix, the result of an acute process, may exist, quiescent, without pain or even discomfort,

but there must have been at some time pain of some kind. Tenderness without pain is much less indicative of an affection of the appendix than pain without tenderness. If anything more than the edge of the colon, muscle border, or tendon or nerve, it may mean a ureteral stone. X-ray search and examination of the urine for red blood cells may make clear a diagnosis of ureteral stone.

The pain of chronic appendicitis differs from the pain of renal colic. To weigh the significance of pain in renal colic, we must go back to its beginning, to the spasm of its first engagement in the ureter, for the pain of an old impacted stone may be slight. The pain in the early days of impaction requires morphia or general anesthesia to control it. After the stone has lodged it may, like an impacted gall stone in the common duct, cause no discomfort at all.

The diagnosis of ureteral stone once it is suggested or suspected is easy. The previous history of renal pain or distress, the intermittent attacks, the gradual shift of the situation, the direction of the pain, and last, but most important, blood, even in microscopic quantities, all point to a stone the presence of which can be accurately determined by X-ray examination.

Richardson cautions against hasty exploratory operations without careful study of each individual case. Fatal explorations have frequently been made in typhoid fever, the operator suspecting an appendicitis; in search for acute lesions that did not exist; in cases of lead colic and ileus paralyticus where an obstruction of the bowel was suspected; in pancreatitis when gall stones were diagnosed, etc.

Richardson not only favors the removal of a diseased appendix, but he also advocates removal of normal appendices if easily accessible during other abdominal operations. When, however, it is proposed to open the abdomen for the removal of a supposed diseased appendix the case should be thoroughly studied; the less clearly necessary the operation the more clearly necessary the careful study of the case.

In all, Richardson has operated for ureteral stones 24 times, in 1911, 5 times in cases diagnosed correctly.

A number of cases are reported showing how easily a superficial examination would miss entirely a ureteral stone, and on the other hand where a ureteral stone has been suspected it can not be found.

Great reliance is placed on X-ray examination by an expert in doubtful cases, but this examination is not always reliable.—(R. S.)

MAYO, WILLIAM J. The incision for lumbar exposure of the kidney. *Annals of Surgery*, January, 1912.

In operating upon the kidney the ordinary lumbar incision does not give adequate exposure of the pedicle, since the greater part of the kidney often lies beneath the rib margins.

By cutting the rib as far as possible posteriorly a remarkable increase in the operating space is obtained; in many of the cases the pleura was opened.

In 203 lumbar incisions it was necessary to cut the twelfth rib 51 times, and in 13 of these the pleura was accidentally opened, but in no case did any harm result; air entered and escaped from the pleural cavity freely as the patient respired. In some instances the rent in the pleura was so large that the lung could be easily seen.

The operations were all made with the patient lying nearly flat on his abdomen, with a moderate elevation of the loins. This position so fixes the chest that the pleura can be opened at its lower part without much danger of lung collapse. Whenever the pleura was accidentally opened it was sutured with catgut, taking in the margin of the diaphragm, the cut pleural margins, and the posterior muscles, with a running suture. In no case, even when pus was present, was the pleural cavity infected. In a number of cases it was found that by exposing the twelfth rib, dividing its muscular and fibrous attachments, especially the quadratus lumborum and the lateral arcuate ligament which binds the twelfth rib to the transverse process of the first lumbar vertebra, there was no need of dividing the rib. By putting a tractor under the rib and pulling upward, the kidney with the pedicle was nicely exposed. The pleura was easily pushed up out of harm's way.

In some cases the twelfth rib is absent or rudimentary, but this is immaterial, so far as the high incision is concerned.

Mayo begins his incisions at a point $2\frac{1}{2}$ inches lateral to the dorsal spines near the outer margin of the erector spinæ muscle. A longitudinal incision is made 2 to 3 inches long through the skin, superficial fascia, and posterior layer of the lumbodorsal fascia which covers the erector spinæ muscle. The incision lies behind the twelfth rib from the angle, if present, nearly to the head, and reaches downward to a point one-half inch below the angle. From this point it passes obliquely downward and forward along the anterior margin of the quadratus lumborum muscle to a point an inch above the crest of the ilium, there turning forward parallel to the iliac crest as far as necessary.

The posterior superior triangle (Kelly) just beneath the twelfth rib is then exposed by cutting an opening through the external and internal oblique transversalis and latissimus dorsi muscles, exposing the transversalis fascia in its lumbar portion. This fascia is then opened freely, exposing the perirenal fat. The ilio-inguinal and ilio-hypogastric nerves are identified and retracted, and the lower part of the incision is completed. The twelfth rib is cleared in its posterior portion upward and backward nearly to the articulation with the transverse process, and the pleura is pushed upward. By

retracting the erector spinæ muscle in one direction and the costal margin in another, a wide exposure is possible, and the kidney can be easily delivered, and there is little danger of a subsequent hernia.

Mayo prefers the lumbar incision, except in those cases of kidney tumors that present a distinct abdominal mass, when the transperitoneal route is used.—(R. S.)

ALCOCK, REGINALD, M. B. F. R. C. S., Edinburgh. **Iodine as the sole dressing for operation wounds.** *British Medical Journal*, February 3, 1912.

In this article a somewhat revolutionary practice in the treatment of operation wounds is advocated. Thirty-one cases are cited, including all manner of abdominal operations, in which nothing but iodine was used on the wound after operation; no gauze, cotton, wool, or any protective dressing, and the results were uniformly perfect.

Medical opinion concerning the utility of iodine as an agent in the production of asepsis has oscillated between contemptuous neglect and unqualified praise. At the present time its virtues are recognized on every hand, and its exceptional usefulness as a skin sterilizant needs no further emphasis.

As is well known, difficulty is experienced in rendering the deeper layers of the skin sterile, and any moisture of the skin leads to the presence of bacteria, where they would have been absent if attempts had been made to demonstrate them on the dry skin.

Stress is laid on the assertion that the sweat glands of the skin serve as a resting place for bacteria, and this may explain why so much difficulty is experienced in sterilizing the hands, as the palm of the hand contains no other glands except these sweat glands winding intricately through the epidermis. The effect of the application of iodine to the skin is, first of all destructive to the microbes of the surface, and, for a very short distance by its penetrating powers, of those embedded in the very superficial layers of the skin. Probably as equally important an effect is the locking-up of the microorganisms in the sweat glands by its hardening action on the skin and the simultaneous contraction of the mouths of the glands.

As is well known, the surface of the skin must be perfectly dry if success with the iodine preparation of an area previous to operation is expected. Working on these lines, it would seem, that there is very great objection to dressings in any form, for, if the patient has the least tendency to sweat, the most likely place for it to happen is on that part of the body which is covered with dressings and a well-supporting bandage, for here are set free the microbes which have not been destroyed, but only locked up for a short period in these skin-penetrating sweat glands. Accepting this, it naturally follows that

a sterile dressing with moisture from the sweat glands, plus albuminous fluid in the serum oozing from the wound, may be regarded as a very good medium for the growth of bacteria, and therefore one is forced to the conclusion that an aseptic dressing is harmful, and that if any dressing is used at all, it should be one including an antiseptic to inhibit this bacterial growth.

The suggestion is made that there is a strong probability that tincture of iodine owes a great part of its therapeutic action to the hyperaemia it induces, like the Bier treatment, causing a phagocytosis or intracellular destruction of microorganisms in the neighborhood of the wound, and also on account of the increased flow of blood to the part, causing a more rapid union of the cut edges.

The usual method of preparation of the patient is advocated; that is, in the ordinary case, a full bath and shaving the day before, no bandage or dressing of any description. If an emergency case there is no preliminary washing; simply a dry shave. When patient is on the table rub area with ether. We use iodine and benzene, 1 to 1,000. The area is allowed to dry and then painted with iodine, which is allowed to dry.

The following precautions are considered essential for success in the "no-dressing" method: Perfect asepsis; all bleeding stopped and the wound rendered quite dry; no wet swabs are to be used, in order that the skin may be kept dry, and only that blood is to be cleaned away which adheres either to a plain dry swab or is removed by the iodine-containing swab when applying it to the stitched-up wound.

All abdominal and deep wounds are to be sewn up in layers; peritoneum, muscle fiber, sheaths, and skin to be united separately to give the necessary support. Care is to be especially taken in skin apposition.

Iodine is to be applied immediately after operation, and again three hours afterwards, to render sterile any serum or blood which may possibly have oozed out.

The clean nightshirt is pulled down and the patient returned to bed, being watched until completely recovered from the anesthetic, and the hands are to be kept outside the bedclothes to see that there is no unconscious interference with the possibly irritating wound. And here mention is made of the fact that if the patient has rubbed or even scratched his itching wound no harm has resulted.

The wound is again painted over daily for the next three days. In wounds around rectum or genitals the wound is painted after each urination.

The method is, of course, only applicable to those cases in which the wound can be absolutely closed up. In all abdominal cases and hernias the administration of morphia and atropine, immediately after operation, to prevent vomiting is advised. In some forms of

umbilical and ventral hernias, where there is no muscular support, some kind of a binder, such as a sterilized towel, may be necessary until all danger of vomiting has passed.

Certain advantages are claimed for this method, viz.:—economy of dressing; patients are more comfortable and do not feel trussed up, nor have they much difficulty in breathing; fewer stitch abscesses or superficial infections.

This method is radical, but the use of iodine has become so universal in the operating room that one can not very well predict the future. Our results in the use of iodine in the preparation of the field of operation during the past year and a half have been perfect, but we are looking forward with much interest to statistics on peritoneal adhesions. It has been claimed that abdominal adhesions are on the increase since iodine sterilization has come into common use. It is well to keep this in mind and protect the intestines carefully by pads so as not to allow them to come in contact with the skin which has been painted with iodine. This last statement rather conflicts with the writer's advice to use only dry pads. Our opinion is that a dry pad should never come in contact with the peritoneum.—(C. M. O.)

MACLEOD, HAROLD H. B., F. R. C. S., Edinburgh. A review of recent methods for the radical cure of hernia. *British Medical Journal*, January 20, 1912.

In this article attention is drawn to the following facts:

- (1) That practically all oblique inguinal hernias and femoral hernias are caused invariably by the presence of a congenital sac.
- (2) There is no evidence to support the view that congenital weakness of the abdominal wall in the inguinal region is a factor in the causation of inguinal hernia.
- (3) While actual weakness of the abdominal wall in the inguinal region is frequently met with, and is an occasional cause of such recurrence after operation, such weakness is not congenital, but is an acquired weakness due to the existence of the hernia or the prolonged use of a truss, or both.
- (4) Complete removal of the sac when performed before the abdominal wall has sustained such damage will not be followed by recurrence.
- (5) The causes of recurrence after operation are:
 - (a) The above-mentioned acquired weakness.
 - (b) Incomplete removal of sac.
 - (c) Traumatism, the result of a mistaken method of operation.

The acceptance of these views leads to the conclusion that ordinary inguinal and femoral hernia are not ruptures in the sense of being due to strain, but are primarily due to a congenital sac and are impossible without it.

Striking confirmation of the frequent presence of this preexisting sac has been recently brought forward by Mr. R. W. Murray, and is referred to in Prof. Alexis Thompson's *Manual of Surgery*. Mr. Murray made 200 consecutive post-mortem examinations upon persons in whom during life there had been no history or evidence of

hernia, and in these he found no less than 68 diverticula of the peritoneum, of which 44 were femoral, 22 inguinal, and 2 umbilical, showing clearly that this preexisting sac is no mere hypothesis.

If this be so, it follows that most of the operations practiced for the radical cure, which deal so largely with suturing the canal, are unnecessary, and that those that divide the canal freely to obtain access or to divert the cord are injurious.

According to the writer, the sac is *the* thing; free it by disturbing the cord and surrounding tissues as little as possible. The neck of the sac is much longer than is often supposed, but it must be clearly separated from the cord to its actual junction with the peritoneum; after being thus freed, it is displaced upward and outward by drawing it through an opening in the internal oblique and transversalis muscles at a point three-fourths inch above and to the outer side of the internal ring, and then removed. Patching of the canal is unnecessary, and usually a source of weakness and further trouble, and is always to be avoided except when one is obliged to open the canal in order to deal effectively with adherent omentum, retained testes, etc.; then, of course, any damage done to the canal must be repaired by suture.

A sufficient number of cases are reported which would seem to substantiate the writer's claim, or at least seem to call attention to two important points, viz:—

(a) The preexistence of peritoneal diverticula in most cases of so-called traumatic hernias. This is of particular importance to the military surgeon as regards whether or not the hernia is "in the line of duty."

(b) The importance of paying particular attention to freeing the whole sac in hernia operations. In our operations we pay strict attention to this, pulling the sac well out and up before ligating.—
(C. M. O.)

RICHARDSON, EDWARD H., M. D., Baltimore, Md. *Studies on Peritoneal Adhesions.* *Annals of Surgery*, December, 1911.

The writer presents a collective and analytical review of the voluminous literature on this subject, classified along practical, common-sense lines, and draws such conclusions as seemed warranted.

Attention is drawn to the fact that adhesions, like bacteria, are of two kinds—those which are useful and of essential worth to mankind and those which are harmful and inimical to life or health. They represent in every instance nature's best method of defense or of repair, and it is highly probable that they will always remain a necessary part of abdominal surgery, and that we can never hope to discover a prophylactic or curative agent that will prove to be a panacea for all cases.

The several characteristics of the peritoneum are briefly considered because of their important bearing on the subject.

First of all, the enormous area of this serous membrane, which has been estimated to be only slightly less than that of the skin. Again its remarkable absorptive power and the well-known ability of the peritoneum to successfully cope with an astonishing amount of infection without itself being seriously or permanently damaged. Another familiar characteristic of the peritoneum is the remarkable variation of sensibility exhibited by different portions—in a general way the visceral part being entirely insensitive to pain, pressure, heat, and cold, while the parietal portion is everywhere exquisitely sensitive to these sensations. This last feature should be taken advantage of, and strive to limit the formation of post-operative adhesions to the viscero-visceral rather than to the viscero-parietal portion, for the double reason that the former are not only painless but, generally speaking, far less dangerous.

One of the most striking characteristics is the rapidity with which the peritoneum can form adhesions, and even more remarkable is the completeness with which it can absorb adhesions.

The various agencies ordinarily coming in contact with the peritoneum that might be considered inimical to the vitality of the endothelium and thereby acting as a factor in forming adhesions are: (1) Blood, (2) sutures and ligatures, (3) eschar of the thermocautery, (4) air, (5) infection, (6) mechanical, chemical, and other agents.

Emphasis is given to the abundant proof that raw surfaces and other less severe injuries resulting from direct mechanical insult furnish the most frequent cause of adhesion, hence the greatest care should be exercised in all intraperitoneal manipulations. Rough handling of the viscera, unintelligent, or, one might say, almost brutal, use of retractors and other instruments; mauling the bowel surface by the introduction of innumerable gauze pads; the application of dry gauze to the peritoneal surface; careless application of hæmòstats with indifference to the mass of crushed tissue left to necrose in the grip of the ligature—all of these constitute digressions of which few surgeons can claim innocence. But they also constitute a prolific source of adhesions, and should therefore be borne in mind.

Certain devices to prevent adhesions—such as collodion; a gelatin-formalin coagulum; aristol; silver foil; solution of gutta-percha in (a) chloroform, (b) xylol, (c) carbon-bisulphide—have been used, but without any material success.

Specific drugs—used either locally or by mouth, such as phosphorus, adrenalin, iodides, thiosinomine, and fibrolysin—have received considerable attention and have given some encouraging results, and it would seem that chemotherapy might prove of value.

Various lubricants, viz.: lanolin, paraffin, olive oil, agar, vaseline oil, etc., undoubtedly possess some merit as a prophylactic against some adhesions.

Nonviable animal membranes, such as the so-called Cargile membrane made from the peritoneum of the ox; a similar membrane from the shark's peritoneum; goldbeaters skin, derived from the cæcum of the ox; and a finely woven cloth made of catgut, are used but are of no practical value.

Viable grafts are much more rational means of covering up raw surfaces on the peritoneum. Graft of fresh omentum and peritoneum have a very important and wide field of application in abdominal surgery, and either autoplasmic, homoplasmic, or heteroplasmic grafts may be used.

It is futile to search for some agent that will banish adhesions from the realm of abdominal surgery, inasmuch as the process involved in their formation is identical with those involved in peritoneal repair.

In dealing with peritoneal adhesions the surgeon has recourse to three classes of procedures: (1) Measures which prevent their formation; (2) measures which restrict their formation to the harmless variety; (3) measures which aid in their absorption.

Injury or death of the highly vulnerable surface endothelium is sufficient to set in motion the chain of pathological events which may terminate in dense adhesions.

Etiologically there are a number and variety of factors involved, but they can all be grouped under the two heads, sepsis and trauma.

As specific prophylactic and curative measures, emphasis should be given to: (1) Rigid asepsis; (2) the use of moist hot gauze; (3) careful covering of all raw surfaces; (4) avoiding unnecessary exposure; (5) restricting trauma; (6) gastroenterostomy and entero-enterostomy; (7) returning the viscera to their proper anatomical relationship; (8) spreading out the omentum over the visceral surfaces before closing the abdomen; (9) careful closure of the peritoneum. A number of additional safeguards are available which have been tested and proven to be of value under certain conditions. The most reliable of these for general use are: (1) Viable grafts of omentum or peritoneum; (2) lubricants; (3) judicious ante and post operative therapy, especially with reference to posture, catharsis, enemata, and length of stay in bed.

Success in the management of the more aggravated adhesion case depends largely upon accurate clinical diagnosis, followed by intelligent operative procedures, as pointed out.

In properly selected cases the use of adjacent mesentery for covering raw bowel surfaces possesses distinct advantages over all methods hitherto proposed.—(C. M. O.)

GIBSON, C. L. The surgical treatment of colitis. *Annals of Surgery*, January, 1912.

The author claims credit for devising the operation of cecostomy for the treatment of ulcerative conditions of the large intestine. The operation was devised to do away with the artificial anus with its accompanying discomforts that was in use by many surgeons prior to 1900. Weir utilized the appendix for his opening into the cecum, in a case in which he originally, at Gibson's suggestion, had planned to do a cecostomy.

Use is made of the same technique in placing and holding the tube in the cecum as is done in a Kader gastrostomy.

Gibson describes his technique as follows:

A small incision, preferably the McBurney intermuscular, is made over the caput coli. If desirable, the anesthetic can be discontinued so soon as the peritoneum is opened. Nitrous oxide gas anesthesia might be used. With an intelligent and self-controlled patient local anesthesia might suffice. Should there be any difficulty in bringing the colon to the surface, I see no positive disadvantage in utilizing the lower ileum. Two Lembert sutures, half an inch apart, are inserted, and the cecum opened between them. A soft catheter about No. 30 Fr. is introduced so that it projects well into the bowel, and the original sutures tightly tied. The wall of the gut is further infolded around the tube in two superimposed layers. The ends of the superficial are used to suture and hold the cecum to the musculo-aponeurotic structures. The tube may also be secured in place by passing a fine catgut stitch through its wall. The abdominal wound is closed at the angles or packed. It will be safer not to begin irrigation before three or four days. The tube may be withdrawn in a week or 10 days, being introduced only when necessary for the irrigation and withdrawn so soon as it has served its purpose. If our ideal has been attained, there will be no leakage, even when the colon is visibly distended. Treatment should be persisted in until a cure is obtained. Closure of the fistula occurs spontaneously with the discontinuance of the daily passage of the catheter.

Claim is made that cases of colitis other than tuberculous and at times amebic are cured much quicker by frequent mechanical cleansing of the ulcerated surfaces and by neutralizing the products of decomposition by regular irrigations than can be accomplished by medicinal measures.

If well borne, Gibson prefers irrigations at regular intervals, 8 to 12 hours, using salt solution, solutions of quinine, silver nitrate, methylene blue, or whatever solution may be indicated. A proteid diet is advised in most cases of colitis.—(R. S.)

HYGIENE AND SANITATION.

Medical Director H. G. BEYER and Surg. C. N. FISKE, United States Navy.

A symposium on the effects of athletics on young men. *Medical Times*, February, 1912, Vol. XL, No. 2.

As a result of the views upon this subject expressed by the Surgeon General of the Navy in his annual report for 1911, the *Medical Times* addressed letters to certain medical men occupying positions which would make their word authoritative, requesting an expression of opinion. The substance of their replies is given below:

[ANDERSON, W. G., M. D., director of the gymnasium, Yale University.]

Statistics prove "that the man in college, or out of it, is better for consistent exercise of some sort. But it is not so certain that the man whose enthusiasm for and proficiency in some sport brings him to the highest recognition in his college is correspondingly benefited." A study of the mortuary data collected by the secretary of Yale University, extending over a period of 50 years (1855-1905) showed that, of the 808 men who had won the "Y" on the football, track or baseball teams and on the crew, there had been 58 deaths. (Consumption, 12; pneumonia, 6; typhoid and unknown, 5 each; heart failure and drowning, 4 each; typhoid pneumonia and suicide, 2 each; and a variety of other conditions, 1 each.) This is a percentage of 7.2. "Comparison of the mortality of these specialized athletes with the general graduate who has not distinguished himself in athletics to the extent of winning the 'Y' shows in favor of the athletes." Of 10,922 students from 1855 to 1905, inclusive, 1,406 are dead and 9,516 living, a percentage of deaths of 12.9. It must be remembered, however, that the athlete "is a triply selected man, first by his membership in college, second by his membership in the athletic group, and thirdly as the pick of the athletic group." These mortuary data were examined by actuaries of insurance companies, who pronounced the athletes safer risks than the nonathletes.

From his study of this question the author concludes that "the Yale athlete does not die young, nor is heart disease a leading cause of death. Lung trouble is the cause of the greatest number of deaths, but the percentage of men dying from these causes is not greater than the expected death among nonathletes from similar causes. A comparison of the causes of death among athletes and those insured in the Mutual below 45 years does not develop any irregularities in the distribution of deaths. The proportion of deaths among athletes from tuberculosis was 22 per cent; among the Mutual's insured below 45 years it was 45 per cent. The question of whether

athletes were long lived because they were athletes or because they were selected men can not be determined without comparison of their records with those of men of equal physical ability who did not take part in competitive athletics."

(It is presumed that in the use of the word "Mutual" the author refers to the Mutual Life Insurance Co. of New York.)

[SARGENT, D. A., A. M., S. D., M. D., director of Hemenway Gymnasium, Harvard University; medical director, Sargent School for Physical Education, Cambridge, Mass.]

"I have no hesitation in saying that, in my opinion, a considerable number of students in our colleges who participate in athletics do injure themselves." These injuries are due largely to accidents, but "the number of men permanently injured compared with the number permanently benefited by playing football is exceedingly small." The number of these accidents has been reduced by changing the rules of the game, and "football is less injurious to the heart and system generally than are basket ball, rowing, and distance running."

The author believes that the weakness of the present system lies in the fact that general gymnastics and athletics are not made an "integral part of the training of youth," and, as a "consequence of this neglect, the larger portion of our college youth give little or no time to the practice of athletics, while a small minority have undoubtedly carried their athletics to excess." The most danger lies in the trials of those who are attempting to make the teams with too little preparatory training, and it is here, where the intense rivalry leads to "pulling oneself out to the last link," that injuries to be felt in after life are likely to occur. "The remedy I would suggest, therefore, is not less athletics, but more; less of the intensive, narrowly constructed and highly laborious forms of athletics, more of the diffuse, widely extended, and much more enjoyable forms of sports and physical exercises." The author suggests a system whereby all of the students shall take part in athletics and be graded by competition with each other in much the same way as in their mental development.

[SHARPE, A. H., M. D., school physician and football and baseball coach, William Penn Charter School; assistant in the nose, throat, and eye clinics, Philadelphia Polyclinic and Wills Eye Hospitals.]

The author practically limits his expression of opinion to the matter of football, in which game he himself has taken an active part. He is entirely in favor of "football and other sports" as at present carried on at all recognized universities and "prep" schools. He feels that football is "the only game we have that demands the best a man has physically, and, as we have plenty of other games suited to all ages and strengths," he "can see no good reason why we should not have one limited to the strong."

[ESTES, W. L., M. D., lecturer on physiology and hygiene and consulting physician, Lehigh University.]

"I venture to give as my opinion that, as ordinarily conducted in these modern times, both training for athletic sports and indulgence in the several athletic games are improperly conducted and conducive to grave evils. I can not say that this is due so much to actual injuries as to the ulterior effects of overexertion, especially on the part of boys who are undeveloped and whose training as a rule is too short and desultory to withstand the tremendous and sometimes prolonged efforts of the athletic contests."

The author goes on to state that the average college boy is from 18 to 24 years of age, he is in a developmental stage, and with little training is called upon to endure the violent muscular exertion and the excitation of his nervous system resultant upon the hours of practice and expectancy. He has found as a result in many instances dilatation of the heart, which in some cases was so extensive and severe as to terminate the individual's usefulness as an athlete. Comparatively few of these cases have been incapacitated for future activities.

He advises systematic, regular, and graduated exercise as a part of a college course. That there be two classes of students, one of which will make "athletics a profession and will continue their muscular development after they leave college, and the other which will take up athletics simply as an aside and not indulge in prolonged contests, but simply develop their muscular systems coincident with their nervous growth."

He then discusses the faulty diet of the training table and the moral effect of contests, which lead to wagering large sums and brutal and unfair practices in the effort to win.

[PHILLIPS, P. C., M. D., professor of hygiene and physical education, Amherst College.]

Thirty years of experience with competitive athletics convinces the author that, as now practiced, they result in physical benefit to the participant. Excess, physical unfitness at the start, and disabling injuries are causes of trouble. Most benefit is derived to the squad at large in preliminary training. Athletics needs more careful supervision.

[BABBITT, J. A., M. D., medical director of Haverford College, instructor in the University of Pennsylvania, member of the National Collegiate Athletic Association.]

Careful investigation shows only two or three positive deaths from football. The question of long and arduous conditioning is a serious one, but there are great compensatory benefits. The author feels that we will "take a step backward in the national physical strength if we limit elements of physical hardihood and substitute more enervating types of recreation."

[REED, D. B., M. D., medical examiner for men, University of Chicago.]

The author thinks the question one that is particularly difficult of demonstration, in that only cases showing deleterious effects come under medical observation. He believes that a smaller percentage of athletes than of nonathletes go wrong physically, but the athletes are picked men. There are some cases of almost certain bad after effects, which appear generally in the circulatory system. There are, however, many more cases of benefit, which seem to be permanent. Injurious after effects are more apt to be due to track, basket ball, or tennis than to football or baseball. Aggregate after effects, the author believes, are good. Bad effects are usually due to (1) laxity of supervising those who take part; (2) continuation of violent exercises in later life, with competition between men of 40 years and men of 20 years; (3) the practice of boys (15-19) engaging in strenuous athletics when in preparatory schools.

[GWATHMEY, J. A., M. D., former medical and physical director, Vanderbilt University; anesthetist to the New York Skin and Cancer and the Columbus Hospitals, etc.]

This author's idea is summed up in the last paragraph of his letter, as follows:

The gist of this opinion is this: That every man in the institution should be trained moderately instead of a few men who do not need the training being trained to the limit of their physical powers.

[LAMBERT, W. A., M. D., physical director of the University of Virginia.]

Concerning the later injurious effects of football, the writer states "that not one case of after development has come to my attention."

[RICHARDSON, M. H., M. D., Moseley professor of surgery, Harvard University; surgeon in chief, Massachusetts General Hospital.]

The writer has seen a few accidents in football in different parts of New England, "but never were there any serious or permanent results." He further states:

In my practice I have never seen any disabling after effects of football or any other game whatever, nor have I known of any such.

[WYETH, J. A., M. D., president and professor of surgery, New York Polyclinic Medical School and Hospital, etc.]

"I can not approve of the game of football as played now in inter-collegiate contests." The writer feels that there is overstraining in preparation for and in playing the game. "I am strongly in favor of steady and vigorous physical exercise * * *."

[ROSS, G. G., M. D., instructor in surgery, University of Pennsylvania; surgeon to the Germantown and Stetson Hospitals; assistant surgeon to the German and University Hospitals.]

The writer believes that football, rowing, and track athletics, especially long-distance running have a deleterious effect on the

health of the average man who participates in them, due mostly to the fact that young and undeveloped youths take part. The trouble lies in abuse of the exercise due to overpowering desire to excel. "College athletics should be cultivated and regulated, not abolished."

[BROWN, L., M. D., resident physician, Adirondack Cottage Sanitarium.]

The writer states that he has always felt, and still believes, that men who have gone into college athletics and then have given them up for sedentary occupations are more prone to tuberculosis than other men. He himself is a case in point, and he has professionally seen a number of other instances.—(PASSED ASST. SURG. JOHN L. NEILSON, U. S. NAVY.)

ROSS, SIR R., and EDIE, E. S. *Mosquito Larvicides*. *Annals Trop. Med. & Parasit.*, 12-31-1911.

The fact that the larvicide ordinarily used (petroleum), while very satisfactory for wells or tanks, is not so for pools with grass or weeds or for stagnant places along river banks is brought out. They experimented with a larvicide used in America and containing 300 parts crude carbolic acid, 200 parts resin, and 30 parts caustic soda. This larvicide, even in 1 to 1,000 dilution, did not kill all the larvæ in 18 hours. It is stated that a satisfactory larvicide should kill all the larvæ in 18 hours.

"Sanitas-Okol" in 1 to 10,000 dilution killed the larvæ of *Anopheles bifurcatus* in about eight and one-half hours. Experiments were also made with corrosive sublimate, oxalic acid, and copper sulphate, but these agents were unsatisfactory. They then tried potassium cyanide and found that a dilution of 1 to 300,000 would kill all larvæ in a pool.

On account of the great danger of poisoning from potassium cyanide they recommend that it should be used only for stagnant pools or in water which is not to be, by any chance, used for drinking water. A tablet containing about 3 grains would suffice for about 15 gallons.—(MEDICAL INSPECTOR E. R. STITT, U. S. NAVY.)

CAZAMIAN, DR., MED. DE IRE CL. *Sur une Cause Possible du Goût Empyreumatique de l'eau de boisson à Bord des Navires de Guerre*. *Arch. de Med. & Pharm. Nav.* Tome 96, No 7, July, 1911.

The most common causes of the smoky taste in drinking water on battleships are either a soiling of the evaporator tubes or a solution of their continuity. But on the *Amiral Aube*, in November, 1910, another cause was found much simpler and quite unexpected.

The evaporator tubes on this ship, hard to see in place, as they pass behind the apparatus, leading from the evaporator feed-water heater, carry to the cooling plant steam and its water of condensation, which

has served to heat the evaporator water, and which as it comes from the boiler is consequently tainted with empyreumatic products. The purpose of such an arrangement is to increase the output of the evaporator by utilizing not only the salt-water steam but also the boiler steam, to fill the tanks with fresh water, and possibly to fill also the drinking-water casks.

Where the piping branches off, one branch going to the flushing system and the other to the cooling plant, it is controlled by a stopcock, so if by carelessness or ignorance on the part of the man in charge when they are making drinking water, the stopcock is left open the casks receive through the whole operation a stream of this smoky tasting liquid. If, however, the evaporators function constantly in triple effect, if they only seek to recover the steam from evaporators 2 and 3 associated in series, independent of the boiler steam, the water condensed will have no taste. But the evaporators are almost never run in triple effect; their adjustment is too difficult under such conditions, consequently boiler steam enters directly into the water condensed.

In conclusion, the writer offers the following suggestions:

1. All apparatus concerned with the production of water for general ship use, such as flushing, washing and cleaning, should be absolutely separate and distinct throughout from the apparatus connected with water for drinking.
2. No alteration in any of this machinery should be performed without the approval of the ship's surgeon, who should have supervision and control over all water distilled for drinking purposes.—(PASSED ASST. SURG. C. L. MORAN.)

ROSENAU, M. J., and AMOSS, H. **Organic matter in the expired breath.** *Journal of Medical Research*, 1911, Bd. 25, H. I., page 35.

The authors conclude that organic matter is demonstrated in the expired breath by the reaction of anaphylaxis. Expired air from men was passed through a cooling device and the condensed liquid collected. This was used to sensitize guinea pigs. Of 99 animals injected, 26 reacted positively on the subsequent injection of normal human blood serum. In some cases death resulted in anaphylactic shock. The presence of a proteid in expired air of a higher molecular constitution than peptone is inferred. The quantity varies in different individuals. All precautions were taken to prevent contamination of the condensed air with protein from outside sources. It is assumed that this proteid is exhaled in a state of very fine colloidal suspension.—(ASST. SURG. E. W. BROWN, U. S. NAVY.)

MORRES, W. **Tests for ascertaining the freshness of milk.** Zeit. Untersuch. Nahr. u. Genussm., 1911, 22, 459-464.

The alcohol test for milk, which depends on the fact that milk containing upward of 8° acidity usually curdles when mixed with twice its volume of 70 per cent alcohol, is not always a reliable test, as the curdling may be caused by means other than formation of lactic acid. For instance, milk may be on the point of curdling owing to the presence of rennet produced by bacteria, although it may contain but little free acid. Various strengths of alcohol have been proposed for use in the test, but the author considers that the use of 50 per cent alcohol will afford useful information. A more stringent test with 68 per cent alcohol may be applied when the milk is intended for feeding infants. The coloration produced when the milk is treated with a solution of alizarin in 68 per cent alcohol gives an indication of the kind of fermentation that has taken place in the milk. Should the milk curdle, but the coloration remain lilac or red, the milk contains only rennet products; acid formation is shown by a yellow coloration.—(ASST. SURG. E. W. BROWN, U. S. NAVY.)

NICE, L. B., Ph. D. **Experiments in book disinfection.** Journal of the American Public Health Association, Vol. I, No. 11, November, 1911.

After experimenting with Beebe's 2 per cent carbo-gasoline immersion for disinfection of books (reviewed in Bulletin vol. 5, No. 3, p. 378), Nice finds the method without merit and believes the fallacy was due to the undried organisms being washed off mechanically. Exposure of books in a closed chamber for at least 32 hours at a temperature of 80° C. and 30 to 40 per cent moisture indicated by thermometer and hygrometer behind an inner glass door is said to kill all nonspore-bearing bacteria in closed books and Nice considers this by far the most effective method, the books remaining undamaged.—(C. N. F.)

DARNALL, C. R., M. D., United States Army. **The purification of water by anhydrous chlorine.** Journal American Public Health Association, vol. 1, No. 11, November, 1911.

Practically chemically pure chlorine liquified by pressure is used by Maj. Darnall from steel drums of 100 to 140 pounds capacity for purification of water in experiments at the Army Medical School and at Fort Meyer, Va. Liquified chlorine costs from 12 to 15 cents a pound; from 3 to 4 pounds are required for each 1,000,000 gallons of water of average purity. No taste or odor is imparted to the water unless 2 parts per 1,000,000 or four times the quantity of chlorine necessary to sterilize be used. Sterilization is practically

instantaneous except for certain spore-bearing nonpathogenic organisms. Reference to the original article should be had to study the details of the simple apparatus required as well as the bacteriological proof of its high efficiency. Cost of installation and operation is very small and this application of a well-known principle, heretofore crudely applied with indifferent satisfaction, should prove one of the greatest modern advances in the purification of polluted waters.—(C. N. F.)

PRINZ, HERMANN, M. D. Oral hygiene (preliminary contribution on the care of the mouth). Interstate Medical Journal, Vol. XIX, No. 1, January, 1912.

Both mechanical and chemical cleansing are of great importance. A mouth wash should be nontoxic, noncaustic, nondecalcifying, be sufficiently antiseptic and, in order to insure continued use, possess good taste and odor.

Careful study of local conditions and needs has led Prinz to evolve the following formula:

Resorcinol.....	3i
Zinc chloride.....	gr. x
Menthol.....	gr. xx
Thymol.....	gr. xv
Oil of wintergreen, synthetic.....	℥. xv
Alcohol.....	3ii
Solution hydrogen dioxide.....	3iii
Water, q. s.....	3viii

Sig.: A teaspoonful in one-half tumblerful of warm water as a mouth wash.

The powder which he considers effective and harmless follows:

Precipitated calcium carbonate.....	3ii
Powdered castile soap.....	3i
Oil of peppermint.....	℥. xx

Sig.: Tooth powder.

Tooth brushes should be carefully selected and used with intent to cleanse every surface. Celluloid tooth picks and waxed floss silk are recommended.—(C. N. F.)

DEDINGHAM, J. C. G., D. Sc., M. B., M. A. On the survival of specific microorganisms in pupæ and imagines of *Musca domestica* raised from experimentally infected larvæ. Experiments with *B. typhosus*. Journal of Hygiene, Vol. XI, No. 3, October, 1911.

Typhoid bacilli could only be recovered from larvæ and pupæ when the culture was supplied following disinfection of ova with lysol. It seemed that hardier organisms more adapted to conditions within larvæ, pupæ, and imagines prevented *B. typhosus* from developing; such organisms are *B. prodigiosus*, *B. pyocyaneus*, and the ever-present *Bacillus* "A," which gave typhoid-like colonies but

failed to ferment sorbite and after a preliminary acidity rapidly rendered litmus-milk alkaline and gave forth an amoniacal odor. Evidently typhoid bacilli in nature are not transmitted from one stage to another in *Musca domestica*.—(C. N. F.)

NICOLL, W., M. A., D. Sc., M. B., Ch. B. On the varieties of *Bacillus coli* associated with the house fly (*Musca domestica*). *Journal of Hygiene*, Vol. XI, No. 3, October, 1911.

A bacteriological study of surfaces and intestinal contents of 145 flies collected from dwelling rooms of London and outhouses of the laboratory showed 27 varieties of *B. coli*, chiefly two organisms, which are considered characteristic of excremental matter.—(C. N. F.)

TROPICAL MEDICINE.

Medical Inspector E. R. STIRT, United States Navy.

RUGE, PROF., Dr. R., Marine-Generalarzt, Kiel. A few words on the distribution of smallpox, tuberculosis, and typhoid in the Tropics. *Archiv für Schiffs- und Tropen-Hygiene*, Bd. 16, 1912. Heft 1.

The author notes the greater attention given by medical men in the Tropics to diseases not strictly tropical.

1. As regards smallpox he states that in India, notwithstanding the efforts of the authorities, the disease is widespread. The fact of the returning pilgrims from Mecca bringing back the disease is brought out. The difficulty of combating smallpox also obtains in Java, where in 1904 smallpox held the first place in morbidity. In Siam the deaths from smallpox outnumber those from plague, cholera, malaria, and dysentery combined. In this paragraph the importance of smallpox as a cause of blindness is dwelt upon and the attention of antivaccination agitators called to it. While smallpox is common in Bangkok, it has little prevalence in Singapore, as a result of the efforts of the English. The disease created havoc in the Philippines until the Americans began their general vaccination. The great number of pock-marked and smallpox-blinded people in China shows the extent of the disease in that country. In Egypt, Tunis, Tripoli, Algiers, and Morocco thousands die annually, and the Sudan has been almost depopulated through smallpox.

2. He next takes up tuberculosis. In many tropical countries this disease takes first place. The terrible prevalence of the disease in India, China, and the Philippines is brought out; it being stated that in Manila more than half of the children under 5 years of age die of the disease. In Africa the disease is widespread; in Egypt, while the desert dwellers are almost entirely tuberculosis free, the inhabitants

of the cities suffer from it as the first or second disease in importance. In Africa the European children of the second generation are often tuberculous and those of the third sterile. Tropical and subtropical America is also heavily infected. Since the Americans almost wiped out yellow fever and smallpox in Cuba tuberculosis has taken the first place. In Victoria, Australia, tuberculosis takes first place.

3. The author finds that typhoid is more widespread in many tropical and subtropical countries than in Europe. In India typhoid plays the same part among children as measles does in Europe. In Tonking, in China, and in the Philippines the disease is common. Persia is a country which suffers from typhoid. The Mediterranean coast of Africa is heavily infected, and in lower Egypt typhoid takes second place in the mortality. It is common in tropical America.—(E. R. S.)

NEUMANN, Prof. R. O. Brauchen die Stechmücken zur Reisung ihrer Eier Blut als Nahrung?—(Do mosquitoes require blood as nourishment in the development of their eggs?). Archiv, für Schiffs- und Tropen-Hygiene. Bd. 16, Heft. 1, 1912.

Mention is made of the fact that when men or animals are bitten it is the female which sucks the blood while the males, although provided with puncturing organs, feed on sugar-containing plants. This fact has had as explanation the necessity of blood nourishment for the development and laying of eggs by the female. He quotes Eysell as stating that while the males without exception feed on the juices of flowers and fruits the females require blood at the time the eggs are to be developed.

Neumann states that his experiments were conducted for a period of four years and carried on with control experiments. He notes the difficulties he had in working with *Anopheles maculipennis*, having been able to keep the species alive for only four generations while with *Culex nemorosus* he was able to develop six generations. He kept *Culex pipiens* going for two years and seven months, and with the greatest ease he reared 83 generations of *Stegomyia fasciata*. He notes that others have had the same difficulty in raising *Anopheles* in captivity. The necessary blood for the development of *C. pipiens* and *S. fasciata* was provided by rats, while for the *C. nemorosus* and *A. maculipennis* he provided blood from his own arm.

The experiments with *C. pipiens* were conducted in an aquarium which was kept in a room the temperature of which was between 17° and 20° C. They were fed exclusively on white sirup which was poured on cotton. Complete metamorphosis occurred—larvæ, pupæ, and then fully developed insects developing from the eggs laid by females from whose nourishment blood was excluded. He does not know how many generations developed, but the number

must have been many during the two years during which he kept up the experiment without a break.

Conducting similar experiments with *C. nemorosus* and *S. faciata* he was unable to get the development which he easily obtained when blood was given them.

He states that he has several times within the last seven years and with many hundreds of *Stegomyia* tried the experiment of feeding them on vegetable nourishment exclusively and always with the same result—there was a lack of the development obtained when blood was provided.—(E. R. S.)

PATHOLOGY AND BACTERIOLOGY.

By Passed Asst. Surg. M. E. HIGGINS, United States Navy.

PRIESTLY, HENRY. An attempt to differentiate the diphtheroid group of organisms. Proceedings of the Royal Society of Medicine, vol. 5, No. 2, December, 1911.

Owing to the number of diphtheroid organisms which have been described, the present unsatisfactory classification, and the lack of a readily applicable test to distinguish them from the true diphtheria bacillus, the author undertook the above investigation.

He examined 49 strains of diphtheroids from various parts of the body, particularly from the external auditory meatus, both of normal individuals and of those suffering from scarlatina. The organisms from the scarlatina cases were of no definite type; a definite type, however, did apparently exist in the ears of normal individuals.

In conclusion he states that the fermentation reactions and serological tests as a means of separation of the different strains of diphtheroids and of differentiating them from true diphtheria are unsatisfactory, and that such differentiation should depend upon all of the cultural characteristics.—(M. E. H.)

ANDERSON, JOHN F., and GOLDBERGER, JOSEPH. The period of infectivity of the blood in measles; An experimental demonstration of the presence of the virus of measles in the mixed buccal and nasal secretions; The nature of the virus of measles; The infectivity of the secretions and the desquamating scales of measles. Bull. P. H. & M. H. S.

In the four papers noted above, the authors working with monkeys showed that the period of infectivity of the blood began just before and continued for about 24 hours after the first appearance of the eruption. From their experiments they determined that the mixed buccal and nasal secretions were infective at about the time of the appearance of the eruption and 48 hours later.

As to the nature of the virus, they developed the following points: The virus may pass through a "Berkefeld" filter, resist desiccation for 25½ hours, lose its infectivity after 15 minutes at 55° C., resist freezing for 25 hours, and possibly retain some of its infectivity after 24 hours at 15° C.

They did not succeed in infecting monkeys with the "scales" from measles cases, but think it highly probable that the desquamating epithelium, in itself, does not carry the virus of the disease.—(M. E. H.)

BASS, C. C. A new conception of immunity. *Journal of the American Medical Association*, November 4, 1911.

Contrary to accepted ideas relative to the nature of complement Bass states that:

1. Human complement capable of acting with human amboceptor to produce lysis, though generally supposed to require moderate heat to destroy it, is, as a matter of fact, destroyed by a temperature of 40° C. in from 15 to 30 minutes.

2. Freshly drawn human serum contains little or no complement capable of acting with human amboceptor.

3. No human specific complement develops at fever heat 38° to 40° C.

4. Human complement which has developed in the blood disappears in from 30 to 72 hours.

The writer applying the above principles states that he has been able to successfully cultivate the three forms of the malarial parasite and transplant them, using citrated blood as a medium.

It is his belief that the virtue of cold applications in inflammatory conditions and a cold climate in the treatment of tuberculosis by conserving the activity of complement enables the immune bodies to combine with the antigen and produce lysis.

He does not give any experimental evidence in support of his theory.—(M. E. H.)

BAILEY, C. H. Complement in human serum. *Journal of the American Medical Association*, December 23, 1911.

Bailey, in a series of experiments with human complement, was unable to verify the statements of Bass relative to the properties of human complement. His experiments were suggested by Bass's paper "A new conception of immunity."—(M. E. H.)

NOTE.—In carrying out the Wassermann reaction in the laboratories of the Naval Medical School according to the technique of Emery, the freshly drawn human serum is used instead of guinea-pig serum.

The serum is incubated at a temperature of 38° C. for 20 minutes before sensitized red cells are added.

As no case has been encountered where there was a deficient amount of complement in the quantity of serum employed to completely hæmolize the unit of sensitized red cells used, it would appear that a considerable quantity of complement is present in freshly drawn human blood, and that a temperature of 38° C. for 20 minutes does not interfere with its activity.—(M. E. H.)

MEDICAL ZOOLOGY.

Passed Asst. Surg. P. E. GARRISON, United States Navy.

WALKER, EARNEST LINWOOD. A comparative study of the amebæ in the Manila water supply, in the intestinal tract of healthy persons, and in amebic dysentery. The Philippine Journal of Science, B. Medical Sciences, vol. 6, No. 4, October, 1911, 259-280, pls. 1-5.

Walker was able to grow amebæ from 23 out of 25 specimens of water collected from taps in the city of Manila, from 6, or 5.3 per cent, of 113 stools of nondysenteric patients and from 2, or 9.2 per cent, of 21 stools of cases of amebic dysentery. He could get no growth from two cases of liver abscess. These amebæ obtained in cultures represented several species which the author does not undertake to differentiate. All of the amebæ, however, which he was able to obtain in culture, whether from feces or tap water, showed the morphological characters of the free-living genus *ameba* Ehrenberg, which Walker describes as follows:

This type of ameboid organism is characterized by an ameboid trophozoite in which the nucleus is situated centrally in the resting organism and in which the chromatin of the nucleus is collected into a relatively large and dense karyosome that is surrounded by an achromatic halo, which possesses with rare exceptions a contractile vacuole, and which reproduces by binary fission and by spore formation; and by multiplying and encysting freely upon artificial culture media.

A second part of the investigation consisted in a microscopic study of the amebæ present in the stools of dysenteric and nondysenteric patients, in the pus of liver abscess, and in intestinal and liver tissue. These amebæ represented a type of organism fundamentally different from the *ameba* type which grew on the culture plates from feces and from water, and agreed morphologically with the characters of the parasitic genus *entameba* of Casagrandi and Barbagallo. Walker states the distinctive points of *entameba* as follows:

The trophozoite has the nucleus situated eccentrically instead of centrally in the resting organism; the chromatin is arranged peripherally instead of centrally in the nucleus; there is no contractile vacuole; reproduction by sporulation does not occur; and multiplication does not take place on ordinary artificial media. The cyst contains 4 or 8 nuclei instead of a single nucleus; a reproductive process takes place in the cyst; encystment occurs only in the body of the host. I believe, the characters of this type of ameboid organism are sufficiently distinct from the *ameba* type to justify the establishment of the new genus, *entameba* by Casagrandi and Barbagallo

(1897) and its adoption by Schaudinn (1903). This genus should include the parasitic amebæ of man and also the parasitic amebæ that have been described in certain lower animals, namely: *Entameba ranarum* (Grassi) Dobell, 1908, in the frog, *Entameba testudinis* Hartman, 1910, in the turtle, *Entameba muris* (Grassi, 1881) Wenyon, 1907, in the mouse, and *Entameba mutalli* Castellani, 1908, in the monkey.

The author summarized his discussion of the nature and significance of the amebæ in stools which will grow on artificial media by stating that it is probable they—

are at most only temporary commensals in the intestinal tract, and more probable that they are only cysts of free-living amebæ which have been ingested with water or food and have passed unchanged through the intestinal canal.

Having confirmed the earlier work of certain authors in differentiating upon morphological ground the free-living genus ameba and the parasitic species entameba the author considers the matter of specific differences between amebæ found parasitic in the stools of healthy persons and amebæ found in cases of true amebic infection (dysentery, liver abscess). Here also he finds in both the vegetative and cystic stages morphological characters clearly differentiating a pathogenic ameba corresponding to the type of *Entameba histolytica* Schaudinn and a nonpathogenic species corresponding to *E. coli* Schaudinn. On the other hand he was not able to observe in either type of parasitic ameba any evidence of the complicated chromidial changes in the nuclei reported by Schaudinn, Hartmann, Craig, Koidzumi, and others. With regard to the validity of the species *E. tetragena* Viereck and *E. nipponica* Koidzumi, Walker states that he has observed forms agreeing in part with the descriptions of these species but that he considers them to represent only reproductive or metabolic changes present in different stages of the organism. The author clearly summarizes his views regarding the identity of the various forms in question in the following paragraph:

In view of the observations that have been presented in the preceding pages, I am of the opinion that, although several varieties of entameba hitherto described are represented, only two well-defined species are found parasitic in the intestinal tract of man. One of this species includes the coli variety of Schaudinn and the nipponica variety of Koidzumi. This species is characterized by its porcelaneous and refrangent appearance, distinct nucleus, and sluggish motility in the living entameba; by the deeply staining, granular cytoplasm, and by the relatively large amount of chromatin which is arranged as a heavy continuous or broken ring (coli variety) or as several discrete masses (nipponica variety) on the inner surface of the nuclear membrane, with transitions between these two varieties, in the stained entameba; and especially by the development of cysts containing 8 nuclei. This species should according to the law of priority, bear the name of *Entameba coli* Schaudinn. It is found in the stools of healthy persons and of persons suffering from diseases other than dysentery and is, therefore, presumably nonpathogenic. The other species include the histolytica variety of Schaudinn, the tetragena variety of Viereck and Hartmann, and probably the minuta variety of Elmassian. It is characterized by its hyaline and feebly refrangent appearance, indistinct nucleus, and active motility in the living entameba; by the feebly staining, reticulated cytoplasm and by the relative paucity of chro-

matin which is arranged either as a barely perceptible layer about the inner surface of the nuclear membrane, with or without a few fragments scattered in the nuclear network (histolytica variety), or as a more extensive but loose granular peripheral layer and a loose central karyome (tetragera variety), with transitions between these two varieties in the stained entameba; and especially by the development of cysts containing 4 nuclei. This species is found only in the stools, pus, or tissues of cases of amebic dysentery, amebic liver abscesses, or of cases having a history of amebic dysentery and is probably a pathogenic species. According to the law of priority this species should bear the name, *Entameba histolytica* Schaudinn. The differences in arrangement of the chromatin in the nuclei of the coli and nipponica varieties and of the histolytica and tetragera varieties probably represent metabolic or reproductive changes in the nuclei of the two species. This view is supported by the presence of forms showing a chromatin arrangement intermediate between these varieties of the two species. It is probable that other imperfectly described species of entameba that have been observed in the intestine of man would be found, on a more complete knowledge of their morphology and life cycles, to belong to one or the other of these two species.

With regard to the practical problem of differentiating the pathogenic and nonpathogenic amebæ in the stools microscopically he states the following:

The most important practical application of these differences in morphology between *Entameba coli* and *E. histolytica* is the microscopic diagnosis of amebic dysentery, especially in incipient or chronic cases, as a guide to treatment and prophylaxis. The differentiation of *Entameba histolytica* and *E. coli* must frequently be made without the help of the characteristic encysted stages. While the diagnosis in the trophozoite stage is not easy, it can be made with certainty by a protozoologist having sufficient experience and using proper care. The examination for this purpose should be made of perfectly fresh stools, repeated, if necessary, on different days, and should be made, if any uncertainty exists, of stained as well as of fresh preparations. Preparations fixed wet in Zenker's fluid and stained with aqueous alum hematoxylin should be employed for this purpose. Greater difficulty may be experienced in diagnosing chronic cases between the periods of exacerbation of the acute symptoms, in which *E. histolytica*, in preparation for encystment, more closely resembles in some respects *E. coli*, but under these conditions a careful search will usually disclose the presence of four-nuclear cysts. The presence of such cysts in the stool is absolutely diagnostic of *E. histolytica*, but a diagnosis from the presence of eight-nuclear cysts in the stool must be made with caution, since there might exist a double infection with *E. coli* and *E. histolytica*.

An experimental study of the parasitism and pathogenicity of the species of the genera *Amæba* and *Entameba* established by this morphologic study have been undertaken and the results of it will be presented in another paper.—(P. E. G.)

HUNTER, W. D., in charge of southern field crop insect investigations, and BISHOP, F. C., entomological assistant. The Rocky Mountain spotted fever tick, with special reference to the problem of its control in the Bitter Root Valley in Montana. Bull. No. 105, Bureau of Entomology, United States Department of Agriculture, Washington, D. C., November 17, 1911.

The fact having been established that Rocky Mountain spotted fever is transmitted by bites of ticks, the authors have determined further in confirmation of the work of Ricketts that the tick concerned in this transmission is in its adult stage parasitic solely upon the

larger domestic animals, the great majority developing upon cattle and horses. The immature stages only of the tick are parasitic upon the ground squirrel and other rodents. The authors contend, therefore, that the transmission of Rocky Mountain spotted fever may be most economically and most scientifically prevented by attacking the adult tick parasitic upon horses and cattle. This attack consists simply in dipping the animals or removing their ticks by hand during the spring and early summer months. The authors estimate that the disease can be eradicated by this method in about three years, and at a cost of about \$23,692.—(P. E. G.)

CHEMISTRY AND PHARMACY.

Astt. Surg. E. W. BROWN and Pharmacist O. G. RUGZ, United States Navy.

DIXON, W. E., F. R. S., M. A., M. D. **Some considerations on the absorption and excretion of drugs.** From the *Practitioner*. Merck's report, November, 1911.

The absorption and excretion of drugs is a subject requiring and deserving much more consideration than has heretofore been given it, and one, it is hoped, which will receive increasing attention in connection with recent strides in experimental pharmacology. The author of this paper believes that our knowledge dealing with this subject is the most limited in pharmacology, and he cites many examples to show the necessity of a more exact and definite understanding of this phase of drug administration. To quote from the article:

Why is it that chlorides should be absorbed so readily from the alimentary canal while sulphates are refused admission into the body? The answer is at present unknown, yet in many instances it is just such facts as these which are at the basis of the action of drugs. It is permissible to prescribe the sulphate of iron quite freely by the mouth, because it is known that only a trace of what is administered will be absorbed; indeed, were it all absorbed there would not be so much difference between the specific toxicity of this substance and corrosive sublimate. Or, to take another example, were one-tenth part of the usual dose of epsom salts absorbed into the system, severe cardiac symptoms would result.

Again, as is stated, drugs are many times administered for purely local effects, and should absorption occur would produce evil results. This absorption does, no doubt, occur at times and gives rise to various symptoms, such as headache, backache, albuminuria, etc. The vegetable purgatives, the anthelmintics, emetics and some of the expectorants are here mentioned:

Adrenalin is another drug which exerts only a local action. If it is taken by the mouth it constricts blood vessels locally in the alimentary canal and during the process is destroyed. When injected subcutaneously the same effect occurs, and a large patch of white skin is induced, but the specific effect of the drug on the heart and other viscera is not generally present because the adrenalin is oxidized before it can be absorbed.

To show the importance of selecting the proper site for subcutaneous injections in connection with absorption the following citations are made:

If strychnine, which acts upon the retinal nerve cells of the eye, be injected (one-thirtieth grain) into the temporal region of a man, the eye on that side is affected; the field of vision, especially for blue, is enlarged and the acuity of vision is increased, but the opposite eye is hardly influenced. This effect must be due to direct diffusion of the drug to the eye, as, if it reached the eye through the circulation, both eyes would be equally affected. It would, of course, be of no use to inject morphine locally into a tissue to relieve a localized pain, since the seat of action of morphine is on the sensory cells in the brain; the local application of morphine in all such cases is based on fallacy and is useless. Even when only rapid general absorption is aimed at, with the object, let us suppose, of acting on the circulatory system, the seat of injection is still important. One example will suffice to make this clear. Tyramine is the principal active constituent of the liquid extract of ergot; this amine, when injected into the left forearm of a man (dose 30 mgrs.), raised the blood pressure from 122 to 128 millimeters of mercury; but the same dose injected round the cellular tissue in the region of the clavicle on another occasion raised the blood pressure from 122 to 138 millimeters. It would appear, then, to be rational to inject our drug under that portion of the skin as near as possible to the organ or tissue upon which it is desired to act, and where a rapid action is desired, to choose some loose cellular tissue.

To show the importance of a knowledge of the properties some drugs exert relative to their absorption, the following is given:

With some drugs considerable delay occurs even after absorption before the desired specific action is obtained. This applies to digitalis and colchicum. Digitalis, after absorption, is slowly taken up by muscular tissue, especially that of the heart, and it is not perhaps till several hours have passed since the introduction of the first dose of digitalis that the patient is under the maximum influence of that dose of the drug. It is for this reason that the treatment of pneumonia by cardiac tonics is commenced early, so that, should the heart commence to fail, it may be already under the influence of the drug.

Examples are also given to illustrate how some drugs when administered are completely destroyed, others modified, or the degree of action influenced, under certain conditions:

For instance: Salicylic acid, as is well known, combines in the body with glyccol, and this renders it inactive; the resulting salicyluric acid is almost nontoxic, and patients suffering from acute rheumatism treated with this body derive no benefit. Derivatives of benzene formed in the alimentary canal as the result of putrefaction are absorbed and excreted in the urine combined with sulphates, which combination greatly facilitates their excretion in the urine, and probably in this way diminishes their toxicity. Nearly all mammals, except man, convert their relatively insoluble uric acid into the much more soluble body allantoin. Man unfortunately does not, and so this nontoxic, though relatively insoluble, substance, uric acid, has been credited with causing every imaginable evil. * * *

The degree of acidity of the urine exerts a considerable effect both on the growth of organisms in urine and on the power of action of antiseptic drugs. Acidity exerts a restraining influence on the growth of organisms in proportion to its degree. But staphylococci and bacillus coli will grow readily in all degrees of acidity which it is possible to produce in man by artificial means. The normal acid of the urine is the acid sodium phosphate, NaH_2PO_4 , and by the administration of this salt by the mouth

it is possible to convert an alkaline urine into an acid urine. The condition of the urine is of paramount importance during the administration of hexamethylenamine. If hexamethylenamine be given to a patient whose urine is alkaline or neutral it exerts no particular effect, and as a genito-urinary antiseptic is valueless. If, however, it be administered to a patient with an acid urine, a small proportion of the drug, varying with the degree of acidity, is converted to formic aldehyde, which may be detected in the urine, and which is one of the most powerful of all known antiseptics. The effect of this drug is well shown by the fact that an acid urine obtained from a patient taking hexamethylenamine may be kept almost indefinitely without undergoing ammoniacal fermentation. The significance of this hardly requires to be pointed out, but it may be desirable in infective diseases of the genito-urinary tract to obtain first an acid urine and then employ hexamethylenamine.

That the rate of absorption of drugs may be influenced by the administration of other substances is well known and the author mentions the influence of alcohol, as follows:

Alcohol is not only absorbed with great rapidity itself from the stomach and intestines, but it facilitates the absorption of other substances dissolved in it. This naturally leads one to speculate whether this action of alcohol may not account for some of the toxic effects associated with indulgence. One fact is clear: That alcohol is not the direct cause of the various cirrhoses which are commonly associated with alcoholics. But may it not be that in a proportion of these people poisonous products are formed in the alimentary canal as a result of putrefaction, and that the presence of alcohol brings about their absorption? Whether this explanation be correct or not, one such poisonous product is formed in the alimentary canal of man under certain conditions and its injection into animals leads to cirrhoses.

The changes taking place upon absorption and the consequent striking action of the new organic arsenic compounds is also commented upon to show the importance of a thorough understanding of the changes in and the ultimate fate of these drugs.

It may be possible that the combination of many of the poisonous drugs with organic substances on absorption, and the consequent changes they then undergo, will explain some of the "tolerances" noted in man and animals for these drugs, such for example, as that of rabbits to atropine.—(O. G. R.)

FITTIFALDI, E. H. **Detection of albumoses in urine.** Deut. Med. Woch., 1911, 37, p. 1890.

Ten to twenty cubic centimeters of urine are treated with six times the quantity of absolute alcohol. After 24 hours the resulting precipitate is separated by decantation and dissolved in smallest possible quantity of 31 to 32 per cent NaOH. This alkaline solution is tested with a freshly prepared ammoniacal solution of nickel (equal parts of strong NH_3 and 5 per cent NiSO_4 solution) and in the presence of albumoses or peptones gives an immediate orange red coloration. The reaction is not obtained with albumin, uric acid, xanthin, hypoxanthin, sarcosin, or urobilin. The method may also

be used for the detection of albumoses in blood after the latter has been heated with animal charcoal, cooled and filtered. The reaction is not given by C-deutero-albumose or A-peptone, but neither do these bodies give the biuret reaction. Albumoses may thus be detected in urine in cases of albuminuria, especially when large amounts of albumin are excreted. This is assigned to the presence of proteolytic enzymes in the urine.—(E. W. B.)

BAUMSTARK. The estimation of free hydrochloric acid in gastric contents by a capillary method. *Zeitschr. f. Balneologie*, 1911, N. 4.

It is stated that on dipping filter paper in a weakly acid solution and allowing the fluid to rise by capillarity, the upper part of the capillary rise is not acid. An equilibrium is established between the acid and water so that the relative height of the acid and the water vary according to the strength of the acids employed. This holds for the free acids only. A compact apparatus applying this principle has been devised. The stomach contents are filtered and a strip of congo red paper introduced. The relative rise of acid and the water above are noted. The method is particularly adapted to very small amounts of gastric contents when a titration would be impracticable.—(E. W. B.)

BEYER, P. E. On the detection of albumin in urine by Merck's tablets. *Maug. Diss., Univ. Bern.*, 1909, pp. 39, tables 4.

The author tested Merck's tablet reagents (Esbach's test, picric and citric acids, Riegler's beta-naphthalene sulphonic acid, and Merck's "A and B," which consists of (A) citric acid and (B) potassium ferricyanid) in regard to their relative value for detecting albumin in human urine, and concludes that Riegler's test furnishes the most accurate and constant results. He also tested the value of Merck's Esbach tablets for detecting creatinin in urine, and found that these served the purpose very well.—(E. W. B.)

SCOTT, WILSON. A method for estimating acetone in animal liquids. *Journal of Physiology*, 1911, Bd. 42, p. 444.

Acetone forms a compound with silver cyanide insoluble in water. The body is collected on a filter, ignited, and the silver remaining is estimated by the ammonium sulphocyanate method, which is described in standard works on urinary analysis. The amount of acetone present is then calculated from the silver determined. Normal urine contains 2 to 4 milligrams of acetone to the liter; this varies with the total nitrogenous output, not with the volume of the urine.—(E. W. B.)

MASLOW, A. A. **A new test for bile in urine.** Zeitsche. f. Physiol. Chem. 1911. Bd. 74, p. 297.

Hydrogen peroxide in the presence of nitric acid oxidizes bile pigments with a resulting intensely dark blue coloration. Ten to twelve centimeters of filtered urine are treated with a 10 per cent solution of barium chloride and centrifuged. The clear supernatant fluid is poured off; 6 to 8 centimeters of ethyl alcohol, which contains 1 per cent of nitric acid of 1.20 specific gravity, and 4 to 5 drops of hydrogen peroxide are added. The mixture is heated, and then allowed to settle. The overlying liquid is dark blue, the precipitate is green. The reaction is obtained with old as well as with fresh urines, also with alcoholic extracts of gall stones.—(E. W. B.)

HERRMANN, F. **Simple method for determining formaldehyde.** Chem. Ztg. 35, 1911, No. 4, pp. 25, 26.

To a glass-stoppered 150 to 200 cubic centimeter Erlenmeyer flask, which contains from 4 to 4½ grams of the formaldehyde solution, add about 3 grams of ammonium chlorid, and then run in as quickly as possible amid shaking 25 cubic centimeters of double normal sodium hydrate solution. After allowing the mixture to cool at room temperature, add 50 cubic centimeters of water which contains 4 drops of a 1 per cent methyl orange solution, and titrate back with a normal solution of sulphuric acid. The difference obtained between the two normal solutions represents the sodium hydrate consumed for the production of hexamethylamintetramin, and when multiplied by 0.06 represents the formaldehyde in grams in the sample. Where much acid is present in the formaldehyde, a correction for the acid must be made by titrating with tenth-normal sodium hydrate and against phenolphthalein.—(E. W. B.)

CABOULAIS, A., and GRIFFON, R. **An indirect method for the determination of the total volume of the gastric contents.** Arch. f. Verd-Krankheit, Bd. 17, H. 4, p. 421, 1911.

The principle of the method is as follows: After the withdrawal of a definite quantity of gastric contents, there remains in the stomach a volume of fluid (v). A measured amount (q) of a solution of sodium phosphate of known titration value (n) is introduced into the stomach through a catheter. After a sufficient interval a definite quantity of the contents is withdrawn and the titration value determined (n'). The calculation is made from the following formula:

$$nq = n'(v + q)$$

$$v = \frac{nq - n'q}{n'}$$

Satisfactory results are claimed under all conditions of volume and composition of the gastric contents. The technique requires about 15 minutes.—(E. W. B.)

EYE, EAR, NOSE, AND THROAT.

Surg. E. M. SHIFF, United States Navy.

VOORHEES, IRVING WILSON, M. S., M. D. Abscess of the nasal septum. Medical Record, January 27, 1912.

The author states that abscess of the nasal septum occurs as the result of local processes, excoriations, after operations, etc., or as a complication of infectious diseases. One may differentiate a traumatic from a nontraumatic form. The traumatic form frequently causes a hematoma, which becomes directly infected through blowing the nose, or the infection enters by way of the blood or lymph vessels. Nontraumatic abscesses may come from infection by continuity, such as erysipelas and diphtheria, or as a metastatic process.

By far the most frequent cause of septal abscess is an injury to the nose. After a punch or blow on the nose there is frequently a fracture of the septum, with the formation of a hematoma between the perichondrium and septum. Pyogenic bacteria enter by way of the blood or lymph streams or through a tear in the mucous membrane. After submucous resection a hematoma sometimes arises, which may become infected and which should be treated after the manner about to be described. Septal abscess and hematoma are usually bilateral.

According to the author the clinical findings are quite characteristic. By lifting the point of the nose one sees on both sides of the septum a mucous-membrane sac that is distinctly fluctuating. Constitutional symptoms in both traumatic and nontraumatic types are sometimes quite severe. Meningitis or abscess in the anterior fossa of the skull may result by way of the anterior and posterior ethmoidal vessels.

The writer states that he has found the following method of treatment serviceable: A vertical incision is made on the left side of the septum at the junction of mucous membrane and skin, and is carried directly across the floor of the nose. A second incision running near to and parallel with the floor of the nose is carried forward from the middle point of the vomer until it almost but not quite meets the first incision. The object of not joining the incisions is to prevent retraction of the flaps and a large amount of resultant scar tissue. The mucoperichondrium is then reflected and the entire abscess cavity is carefully curetted, with flexible curettes, until all pyogenic membrane and detritus are removed. The cavity is now irrigated with a dilute peroxide solution, followed by normal saline, and two drains are introduced. For this purpose the author prefers wick gauze which has been saturated in a 0.2 per cent solution of formaldehyde in boric acid. The first drain is passed through the horizontal incision and is pushed far upward into the pocket. The second drain is introduced through the anterior incision to meet the first drain, but tight packing should be avoided. Finally, a small strip of plain gauze is placed on each side of the septum for support. There is absolutely

no need of making an incision on each side of the septum; moreover, a perforation may result from retraction of the edges of the wounds. Deformity of the external nose follows only when the entire bridge of cartilage along the internal dorsal aspect of the nose is also destroyed.

In an extremely late stage of the disease, according to the author, if the abscess has spontaneously ruptured, if the sac has collapsed, and if granulations have formed about the margin of the wound, the differential diagnosis between residual abscess, tuberculosis, and syphilis may be somewhat difficult. In such cases histological examination of the granulations and bacteriological examination of the secretions make the diagnosis clear.—(E. M. S.)

HOSFORD, J. STROUD, F. R. C. S. EDINBURGH, AND JAMES, G. BROOKSBANK, F. R. C. S. EDINBURGH. *Observations upon the treatment of gonorrheal conjunctivitis in the adult.* The Lancet, January 13, 1912.

The authors state that they have observed, in common with most ophthalmic surgeons who have given attention to this subject, that gonorrheal conjunctivitis in the adult is, in all cases after the age of 30, attended with most disastrous results to the eye. Not only is all useful vision in these unfortunate cases completely lost, but the damaged and shrunken globe not unfrequently remains, a distressing and unsightly object in the orbit. They believe that this untoward result is preventable if the patient is seen early and appropriately treated.

The involvement of the cornea constitutes the great danger in the affection. (1) It may slough wholly from strangulation caused by pressure of the brawny lids and the gelatinous chemotic swelling around its margin. (2) Its epithelium may be readily abraded and a site exposed for the ingress of the gonococci by even the gentle manipulations of a skilled attendant. (3) The digestive powers of the toxic products contained in the discharge have a most deleterious influence on the vitality of the structures of the cornea. (4) To these must be added what the writers have come to consider as the almost uniformly pernicious influence of the caustics and astringents applied in the early stages of the disease.

The writers state that for several years they have adopted the following method in dealing with those very serious cases and with the most uniformly gratifying results. The early symptoms of this disease may be recognized or at least strongly suspected by the practiced eye, even before a culture has been obtained, though this should never be omitted.

Treatment.—The patient should at once be placed in bed and remain there until all danger is passed. A low diet should be prescribed, the bowels kept fully open with mercury and salines.

With regard to the local treatment the authors have found that the constant use of the douche is the primary curative factor. It may be applied either by a mechanical apparatus fastened to the head, or by the hands of a relay of properly instructed nurses. These should sit behind the patient's head and apply the unintermitting stream as the surgeon may direct from time to time. No cessation in the flow is to be permitted for a moment either day or night. The solution which the writers have found to be most satisfactory for this purpose is one of permanganate of potash, varying in the early stages from 1 in 15,000 to 1 in 20,000, and, in the later stages, a solution of boric acid, 8 grains to the ounce, may replace this, and is all that is necessary. The temperature of the solution should be from 85° to 90° F. in the can, where a thermometer should be kept constantly present. No manipulation of the lids, except by the surgeon should be permitted. In the arrangement of the douche the can should be placed not higher than 1 foot above the patient's head. The end of a fine rubber tube leading from it should be either fixed by plaster or held at the naso-orbital margin and the stream allowed to trickle constantly across the palpebral fissure. If a slight coating forms along the lashes, it can be removed readily with a warm solution of sodium bicarbonate, grains 10 to the ounce, the lashes being gently stroked downward.

The writers state that during the first four days, unless complications develop, only the gentlest attempts should be made to expose and inspect the eye. At the end of this time the swelling has usually subsided sufficiently to permit a careful examination of the cornea for signs of infiltration, and the iris for signs of inflammation.

The authors further state that if the douche is discontinued at too early a stage they have found that corneal complications are apt to appear as gray spots at the limbus or in the center of the cornea. A renewal of the irrigation has led to a rapid arrest of further trouble. Even if a definite ulcer appears the douche should be continued, rather than resort to the more heroic measures of the cautery and the silver compounds. The subsidence of the chemosis may be assisted after the tenth day, when the discharge has almost ceased by painting the conjunctiva of the lower lid only with a solution of nitrate of silver, 2 grains to the ounce, or the use of permanganate of zinc drops, grs. one-eighth to the ounce. The globe and upper lid should not be touched by these astringents.

According to the authors there is but little tendency to iritis at this stage under the treatment, but it is their practice to instil atropine solution every other day after the 8th day for the general comfort of the patient. The light of the room should be subdued, the sound eye protected with a Buller's shield, and the nurses should wear protecting gloves of india rubber.—(E. M. S.)

REPORTS AND LETTERS.

EXTRACTS FROM A REPORT ON CASES OF YELLOW FEVER OCCURRING ON BOARD THE U. S. S. YORKTOWN AT GUAYAQUIL, ECUADOR.

[Report dated Jan. 29, 1912.]

By Asst. Surg. C. B. CAMERER, United States Navy.

The U. S. S. *Yorktown* arrived at Guayaquil, Ecuador, at 2.42 p. m. January 7, 1912. Having been informed in Panama that the health and sanitary conditions in Guayaquil at this time of year were frightfully bad, I went ashore with the officer making the official call on the United States consul general, to ascertain all possible information relative to existing health conditions, and fortunately met Passed Asst. Surg. H. B. Parker, United States Public Health and Marine Hospital Service, at the consulate, he being stationed here for the purpose of studying yellow fever, and who cheerfully furnished me with all necessary information desired. Upon the strength of my findings at this time I submitted a statement to the commanding officer at his request dealing with conditions as found and recommendations deemed necessary. These were approved, read to the crew, and posted. A copy is appended, as follows:

In obedience to your verbal order of this date, I hereby submit data relative to health conditions existing here and recommendations deemed necessary to protect the health of this command.

At present yellow fever, bubonic plague, malaria, and dysentery exist. The sanitary conditions ashore are deplorable, and both yellow-fever (*Stegomyia calopus*) and malarial-fever (*Anopheles*) mosquitoes are present in enormous numbers. Bubonic plague is transmitted by means of fleas (*Pulex cheopsis*) and carried usually by rats. The sewage of the entire city drains into the river, and it is further contaminated in passage through the country above the city. The death rate incident to yellow fever is at present 37½ per cent, and as high as 40 cases per week have been reported from here; but the present number is not that high. Malarial fever is very prevalent, and an increase in all diseases is to be expected, due to the wet season and poor sanitary facilities. After discussing the foregoing with Dr. Parker, United States Public Health and Marine-Hospital Service, stationed here, the following recommendations, based upon both of our investigations and findings, are submitted:

- (a) Restriction of all shore liberty, only those on official business to be exempt.
- (b) Restriction of all bumboats.
- (c) Restriction of all supplies from shore, only in exceptional cases.
- (d) No river water to be used for washing decks, clothing, or for any other purposes, except distilling.
- (e) No water of any kind to be left uncovered, i. e., tubs, barrels, tanks, etc., as any so exposed offers a sure breeding place for mosquitoes.

- (f) Boats to be kept carefully dried out.
- (g) Awnings to be kept spread when practicable.
- (h) Anchorage to be shifted further upstream to escape both insects from market and sewage as much as possible.
- (i) All insects, especially mosquitoes, to be killed when possible whenever found.

Mosquitoes were collected from day to day and examined by both Dr. Parker and myself, and during our entire stay only the following types were found on board: (1) *Jansthenosoma lutzii*; (2) *Anopheles argyrotarsis*, subspecies *Albipes*; (3) *Culex fatigans*; (4) *Culex sollicitans*; (5) *Jansthenosoma*, species undetermined (last tarsi white); (6) *Panoplites pseudotitillans*; (7) *Culex tæniorhynchus*.

No *Stegomyia calopus* were found at any time, even after the most careful search. Daily inspections were made to see that recommendations were strictly enforced. All lights not absolutely necessary were kept turned out at night. Hourly inspections were required of the master at arms on watch to see that recommendations relative to containers, etc., were strictly complied with. Rains were of daily occurrence, the river being high, filled with great masses of floating vegetation, and the ship was swarming with insects. Incident to the revolution in progress and the constant occurrence of riots and disturbances on shore, the commanding officer, other officers, and mail orderlies were necessarily on shore to a greater or less extent, both day and night. All were warned as to the danger of entering native houses (bamboo, zinc, and light frame being usual materials used in construction) and instructed in the precautions to be taken. A boat's crew was more or less constantly kept ready for duty ashore * * * and incident to the type of construction of this ship, dearth of adequate berthing facilities, and intense heat, it was found impracticable to protect the entire crew against mosquitoes; furthermore, I was informed by Dr. Parker that we were in no danger from *Stegomyia* where we were anchored, which information has apparently been proven to be correct, as none have been found at any time. One hundred tons of steaming coal were taken on board from the Guayaquil & Quito Railroad lighter the 12th instant, same coming from a collier out in the stream. It was recommended that the men work on the lighter in one-hour shifts, on account of the extreme heat. A boat's crew, consisting of eight men, with C. E. Noren (C. G. M.) in charge, left the ship on the railroad tug *Saranac*, January 13, at 8.35 p. m., to convoy a lighter of coal from the collier to Duran, the party returning to the ship at 11.45 p. m. Two men of this party subsequently developed febris flava. On account of the frequent heavy rains it was found almost impossible to keep the ship absolutely dry, and kerosene was used freely in waterways, boats, and all other places difficult of access which might possibly afford a breeding place for mosquitoes.

Some of the company officials were constantly, and altogether too frequently, as warranted by the gravity of the situation, coming on board to confer with the commanding officer, and their tug was alongside very often, it coming from Duran, where febris flava was present in even greater proportion than in Guayaquil proper.

About 11 p. m., January 15, Commander L. C. Bertollette had a severe chill, accompanied by pain in occiput, lumbar region, and extremities—temperature 101.6°. Symptoms being looked upon as extremely suspicious, he was carefully screened and Dr. Parker was called in consultation the next morning, subsequent to which a positive diagnosis of febris flava was made. In view of the turbulent state of affairs ashore, lack of adequate or proper facilities there at this time, and his physical condition, removal ashore was not considered advisable, so he was kept carefully isolated in his stateroom. Commander Bertollette undoubtedly contracted this disease on shore, as he was more exposed than any other person on board. Dr. Parker made daily visits to the ship and rendered invaluable assistance, both in treating the captain and in the identification of mosquitoes found by me and my assistants. The captain's illness terminated fatally January 24, 1912, at 2.14 a. m., direct cause of death being uremia. January 18, J. P. Jenkins, mess attendant, second class, and C. W. Wood, ordinary seaman, reported at sick bay, complaining of usual symptoms, and with temperatures of 102° and 104°, respectively. Both were carefully isolated and screened. Dr. Parker was called in consultation and both cases were positively diagnosed as febris flava. Dr. Parker's office is situated in the second floor of the United States consulate and, as he had several large spare rooms, a hospital was at once fitted up and screened for the reception of these two cases and any that might subsequently develop. These two men were transferred to him at 4 p. m., January 19, 1912. Wood had been in the regular running boat and had been alongside the docks both in Duran and Guayaquil frequently. Jenkins, to all obtainable information, had not been off the ship. Wood died at 9.30 a. m., January 23, immediate cause of death being uremia, and was interred in the Protestant cemetery on shore. Jenkins suffered a very light attack, and returned to the ship practically well January 25, 1912. It might be well to observe here that our steam launch and motor dory were making frequent trips to Duran and Guayaquil landings at practically all hours for cables and the transaction of other business, and as the steamer required a crew of five men, and the dory two, each increased by a chief petty officer each trip acting as boat officer, and further, as the crew of each was frequently changed, due to repairs, routine, etc., a considerable number of men were necessarily exposed.

All possible precautions were taken and increased vigilance was exercised, mosquitoes collected in large numbers by men specially

detailed and examined, but no *Stegomyia* were found. All remaining mosquito bars on board, not already in use, were served out. The morning of January 22, R. Kelley, coal passer, and R. Simmons, ordinary seaman, reported at sick bay with usual symptoms, temperatures of 102.8° and 102°, respectively. Both were carefully isolated and screened and after being seen by Dr. Parker were transferred to him the next day, as with "diagnosis undetermined," absolutely positive evidence lacking at the time of transfer. Both subsequently developed positive symptoms. Kelley had not been ashore, but Simmons had made trips in the motor dory to the regular landings. Arrangements were made for fumigating the ship in so far as was practicable, i. e., presence of captain on board in a grave condition, and fumigation was carried out the afternoon of January 23, a Clayton apparatus being employed, generating sulphur dioxide gas. Anchorage was shifted clear below the city limits the same evening. During this day R. R. Bauers, boilermaker, and C. E. Noren, chief gunners' mate, reported at sick bay with usual symptoms and temperatures of 102.4° each. Both were carefully isolated as in previous cases, and, after being seen by Dr. Parker were transferred to him as with "diagnosis undetermined"; subsequently both proved positive. Both men had been exposed; Bauers in steamer and Noren in armed convoy previously mentioned. The entire ship was again fumigated January 24 by the same apparatus, the crew being temporarily transferred to the P. S. N. Co. steamer *Quito*. This evening W. P. H. Stephanski, ordinary seaman, reported with the usual symptoms, temperature 102.4°; he was carefully isolated and screened and transferred to Dr. Parker the next morning (Jan. 25) as with "diagnosis undetermined." Subsequently this case also proved positive. The temperatures of the entire crew were taken January 25; three men found to have slight rise were isolated and given ol. ricini, 2 ounces, followed by quinine sulphate, 20 grains, this medication being immediately employed in cases of all suspects so far. The next morning two of the men isolated were found to be normal as to temperature and otherwise; the third having an abscess on left elbow accompanied by a temperature of 101°, was kept isolated, abscess opened and drained, followed by a fall in temperature to normal, when he was released January 27. All soiled bedding used by Commander Bertollette was burned, his stateroom sprinkled with 40 per cent formalin and sealed.

In obedience to department orders this ship left Guayaquil January 26 and anchored off St. Elena the morning of the 27th. Everything was fully opened up, all covers, etc., removed and ship fully aired out. Practically no mosquitoes found on board, those found being either *Culex sollicitans* or *Anopheles argyrotarsis*. Five hundred pounds of sulphur were purchased and preparations are being made for another thorough fumigation.

Febris flava has been steadily on the increase since the occupation of Guayaquil by the national forces from Quito, and a frightful epidemic is expected, there now being some 250 cases in the city and hundreds more expected. The usual average of cases for the year here is above 350. Mortality reported about $37\frac{1}{2}$ per cent, and at the time of our arrival, about 40 cases were known to exist.

In summarizing all cases that have occurred, with possible place of infection, especially as no *Stegomyia* have been found among the hundreds examined, it appears that six cases—viz, Commander Bertollette, Noren, Bauers, Wood, Simmons, and Stephanski—had ample opportunity to contract the disease on shore or from landings, etc. Two men—viz, Jenkins and Kelley—were not off the ship, according to all obtainable information, and their possible sources of infection are apparently reduced to the following: (1) From railroad tug *Saranac*; (2) from *Stegomyia* coming on board from shore; (3) from *Stegomyia* coming on board from floating vegetation; (4) from *Stegomyia* being brought on board in one of the ship's boats, especially the steamer, this boat being fitted with a canopy.

From a knowledge of the habits of the *Stegomyia calopus*, it is rather improbable that either Nos. 2 or 3 are to be seriously considered; No. 4 may be suspected, but as these boats were frequently inspected and their crews were on the alert, it appears to me that the most probable source of infection was from the railroad tug *Saranac*, she being berthed alongside the buildings of the railroad terminal in Duran, and being frequently alongside this ship. Furthermore, she was fitted with a deck house, and could have easily harbored and transferred mosquitoes from Duran to this ship. Incident to the number of cases on board, and the failure to find any *Stegomyia*, it appears that had they been on board, they could not have been in any considerable numbers and either promptly left the ship or were killed by some of the crew.

I wish to express my sincere thanks and appreciation for the invaluable and timely assistance rendered me by Passed Asst. Surg. H. B. Parker, United States Public Health and Marine-Hospital Service, during the course of the epidemic on board the ship, as I would have been hopelessly handicapped, incident to conditions existing ashore, without his kind and able cooperation and help at all times. * * *

Dr. Parker at Guayaquil (Jan. 27) reported that the five patients there were all in good condition, and that complete recovery was expected for all. (These cases recovered, and none developed subsequent to this report.—Ed.)

In conclusion it may be stated that the sanitary conditions existing in Guayaquil at present are most deplorable, no adequate drainage existing and no paving is to be found back of the first two or three streets parallel to the river, after which the streets are nothing but quagmires filled with filth, carelessly covered with loose boards in

places. Water is found standing on every side, houses are constructed of flimsy materials, affording ideal habitations for rats and other vermin, and are without exception unscreened. Yellow fever, bubonic plague, malaria, dysentery, typhoid and intestinal parasitic diseases are endemic, thus rendering this place in my opinion one of the most dangerous ports in the world.

The usual period of incubation for febris flava here is found to be 72 hours, and victims are known to have been bitten by *Stegomyia* at all hours of the day, even out in the bright sunlight. The type of infection here appears to be specially virulent, the majority of patients being prostrated from the very onset of the chill.

REPORT ON MILITARY SURGERY AT FOOCHOW, CHINA.

By Asst. Surg. J. G. OMBELVENA, United States Navy.

[U. S. S. *Pompey*, Nov. 27, 1911.]

In the revolution at Foochow, Fukien Province, China, which occurred November 9, 1911, neither of the forces engaged in the fighting had any surgical corps, and the work of looking after the 200 wounded fell on volunteers. Lieut. E. S. Root gave me permission to assist, and on Friday afternoon of the 10th of November I made my way into the walled city.

Practically all the fighting between the revolutionists and Manchus was done around a high hill which commanded the most of the city, and which had been seized and held by the revolutionists. At the foot of this hill is a large compound of the American Board of Missions, which contains a finished operating pavilion and a large hospital under process of erection. Here most of the wounded of both sides were hurried, and by converting a large dispensary and a college hall into wards, a fairly well-managed hospital had been established upon my arrival. This was all under the charge of Dr. Kinnear, a surgeon of the American Board of Missions.

I was heartily welcomed and immediately put to work, amputating and dressing, and for the next eight days was busy from morning to night. Dr. Kinnear had a plentiful supply of dressings and instruments, and Mrs. Kinnear, who is an experienced nurse, looked after the sterilizing and disinfecting, and considering the large amount of emergency work done, everything was conducted as in a well-regulated hospital in the United States.

There were 71 Manchu soldiers, including 6 officers, looked after, and 60 revolutionists, including 3 officers, were attended to, making a total of 131. These were all major wounds, trivial casualties not being listed.

The Manchus ranged in ages from 71 to 16 years, 7 being over 50 years old and 15 under 21 years.

The revolutionists wounded ranged in ages from 60 years to 12 years, 3 being over 50 and 6 less than 21 years. The 12-year-old boy was quite a hero of the battle and was incidently the first wounded man to be dressed, having received a bullet in the lower jaw.

Only the most urgent cases were operated on, conservative surgery being very noticeable. In some cases this was not due to our desire so much as to the Chinese unwillingness, many of them preferring death rather than endure the wretched existence before them with the loss of a limb. Three shoulder amputations, 2 thigh amputations, 2 or 3 leg amputations, and a number of finger, toe, and hand amputations were performed. Tincture of iodine was used freely over field of operation with satisfactory results.

The anesthetic used was chloroform, the local surgeons claiming that the Chinese frequently developed late lung complications with ether anesthesia. They took the anesthetic well without an exception, going under quickly, requiring a very small amount and coming out readily with little nausea.

One thigh amputation, a Manchu 71 years old, died the second day after, another committed suicide with opium, and the last day I was there a shoulder amputation case died. This case was hopeless from the first and was only operated on to remove a gangrenous offensive arm and shoulder, the bullet entering over the scapula, passing through the axilla, comminuting the upper fourth of the humerus, and emerging anteriorly through a wound about 3 inches across. Secondary hemorrhages set in the third day after the operation, and in spite of packing and controlling the hemorrhage, followed by stimulants and salt solution subcutaneously, he died. The other cases operated on were progressing beautifully when I left.

The wounds dressed comprised 67 severe gunshot wounds, 3 sprained backs from falls from city wall, 8 burns from gunpowder or fires started throughout the city, and 53 lesser wounds of all kinds; many of whom were discharged after the first few dressings or else came in each morning for change of dressing.

The gunshot wounds were of three distinct types: (a) Those made by steel-jacketed bullets, (b) those made by soft-nosed bullets, (c) those made by shrapnel.

Of the wounds by steel-jacketed bullets, 3 were of the pelvis, 1 of which passed through the right hip, then the scrotum, and then penetrated the left thigh. There were 5 penetrations of the lungs, all but 1 of which were doing well, this one being in a serious condition, breathing through the wound and discharging large quantities of blood-tinged serum from the pleura. He was an opium user also, and when not under its influence was tearing the dressings off and requiring constant watching. Of 8 steel-jacketed bullet wounds of the thigh most of them started in the region of the hip, ranging downward and with the wound of exit near the knee, some passing

through the knee into the leg. Some few were infected and had to be drained. Besides these, 2 of the leg, 2 of the neck, 2 of the arm, 3 of the abdomen, 1 of the shoulder, and 1 of the scalp were all making uneventful recoveries when I left. None of the abdominal cases were operated on, and 1 of them seemed to be an undoubted perforation of bowels, but nine days after showed no signs of complication.

Of the soft-nosed bullet wounds there were 8 of the foot, 9 of the leg and knee, 2 of the thigh, 1 of the hip, 5 of the body, 6 of the head, and 14 of the upper extremity. Here were most of the worst cases that came under our care. The bullet entrance would be small, but the exit was never in doubt, generally 2 to 4 inches across with fragments of bone and bullets mingled with lacerated tissue complicated with infection and sloughing.

The casualties caused by shrapnel were generally looked after by the burial party, although we had a number of cases. The 71-year-old Manchu, who died the second day after operation, was one of these cases. He was picked up four hours after an engagement, his leg having been lacerated, or really macerated by an unexploded shrapnel. The shell was found 5 feet away imbedded in some soft earth. Another Manchu was hit in the upper part of his forearm with a piece of exploded shell, both bones fractured and badly comminuted, and the fragments of bone driven through the arm, making what was supposed to have been the wound of exit until the piece of metal was picked out with some other fragments of bone. Other cases of multiple flesh wounds, more or less superficial, were most likely caused by shrapnel.

The routine dressings that we fell into using to a large extent were as follows:

For dry wounds healing kindly, we cleaned with lysol, then dusted with iodoform, and applied gauze held in place with adhesive strips reenforced in various regions with bandages. These would be redressed every two or three days, the neighboring skin being sponged with alcohol, and the Chinese being oversusceptible to dermatitis from the adhesive plaster.

For discharging wounds we would generally irrigate with iodine solution, or lysol solution, pack with iodoform gauze and cover with plentiful dressings of gauze, cotton, and oiled paper, retained with both adhesive and bandages. Through and through drainage would be established where indicated.

While these could be called our routine dressings, partly because of stock on hand, still we were never slaves to them and varied our treatment as the cases would require, being well supplied with hydrogen peroxide, mercury bichloride, potassium permanganate, boric acid, aristol, and other cleansers and dusting powders.

The sprained backs and burns were of no special interest with this exception, perhaps, that six of the eight burns were on the right side

of the face and neck, with a large triangular area on the dorsum of the right hand, and with one exception were Manchus. Probably this was due to the use of some certain style of firearm. A beautiful variety of styles was certainly used.

The opium users caused us much trouble and concern, not only on account of less resisting power and stamina, but because of their sufferings at having the drug withdrawn. In some cases we gave them restricted amounts, and in other cases their friends would smuggle it to them. Otherwise the Chinese impressed me as being a satisfactory class of patients to handle, being easily satisfied, nervy, reacting well to their injuries, and exhibiting to a high degree appreciation of what we were doing for them. I regretted not being able to follow up the cases to their discharge, but as the *Pompey* was leaving for Shanghai and the work was pretty well in hand I returned on board.

Ensign Karl F. Smith, who had charge of the guard of sailors stationed at this compound during the fighting on the hill, made himself very valuable by his energetic work in bringing in the wounded and also in assisting in the dressings.

American and English doctors of Foochow, with a number of Chinese doctors, gave much valuable time to the work, especially the first few days when we were doing most of the operating, and they deserve much credit for their unselfish assistance.

NOTES ON CAMP MEYER, GUANTANAMO BAY, CUBA.

By Passed Asst. Surg. L. W. JOHNSON, United States Navy.

Camp Meyer was established on Deer Point, Guantanamo Bay, March 13, 1911, and continued until June 18, with an average complement of over 2,000 marines.

Deer Point is a plateau about 30 feet high, 150 yards wide, extending for 1,000 yards westward into Guantanamo Bay. The sides fall abruptly to the water level, where there is on the north side a narrow beach; on the south side there is at low tide a flat, formerly covered by mangroves which have been cut away. The prevailing winds at this season blow from the east all day and from the north at night. Tropical showers were frequent during April and May and flooded many of the tents until ditching was completed; the porous soil dried quickly after the rains. A fine dust of powdered coral was everywhere and could be seen from the bay as a cloud hanging high above the camp.

Water was brought from a river above Guantanamo City in tank cars, transferred to water barges, brought to camp and pumped into tanks, from which it was distributed to the camp by gravity. Great economy in the use of water was necessary. Latrines were erected on piles over the water about 50 feet from shore. They were, in general,

satisfactory, but at times the falling tide left fecal matter on the beach, which attracted many flies. Urinals were concrete troughs drained by pipes discharging into the water; they were disinfected several times daily and whitewashed frequently.

Kitchen and store tents were located along the north shore, each at the foot of its company street. When the camp was first established, they quickly became the centers for swarms of flies, later they were screened and concrete floors were put in, materially reducing the number of flies. The canteen and the bumboat man, who was allowed to sell fruit in camp, were inspected daily; they were required to keep their places of business clean and their goods screened, any fruit unfit to be eaten was burned in the incinerator.

The incinerator was located at the end of the point, 200 yards from the nearest tent, and in such a location that the camp was at all times to windward of it. Garbage was collected in covered cans and removed twice daily by the incinerator detail.

All men, on returning from liberty, were required to state whether or not they had been exposed to venereal infection; those so exposed were required to take the prophylactic treatment. No cases of venereal disease developed after such treatment taken within 24 hours after exposure.

Mosquitoes became very numerous after the rains began, particularly on the target range, where the men in the pits were attacked by great numbers which bred in the pools near by. No new cases of malaria developed, although several who had had malaria previously received treatment; all these cases were mild. Many men were bitten by scorpions and tarantulas, but all were limited to a mild local inflammation.

The medical officers were the brigade surgeon, executive surgeon, and the regimental surgeons of the three regiments. Sick call was held for each regiment by its medical officer and each regiment had for its hospital a floored and screened hospital tent in charge of a steward and a detail of apprentices. An old building was used as a dispensary and for dressing minor cases; more serious cases were transferred to the U. S. S. *Solace*. The Hospital Corps had physical drill, litter drill, and, when practicable, daily instruction in first aid, bandaging, and nursing.

During the first weeks of the camp a large number suffered with catarrhus intestinalis of varying degrees of severity; there were no fatal cases, and, as the men became inured to the heat and the changed conditions of camp life, these cases ceased to appear.

Five cases of typhoid fever developed before the protective inoculation was begun. These cases were sporadic and some were probably infected while on board ship. Only one case developed after inoculation was started, and he had had only the first injection; this case was reported by Phelps and Clark in the Bulletin for July, 1911. The

entire force of over 2,000 men and officers received three injections; the skin was sterilized with iodine, and no infections occurred in the 6,000 injections, although the wind and dust made thorough asepsis very difficult. Less than 1 per cent complained of sore arms and none had severe enough reactions to be placed on the sick list.

Cases of heat prostration were numerous, particularly during the rainy months, when the humidity was excessive; there were no cases of heat exhaustion and all the cases yielded promptly to treatment. A number of cases of measles and mumps developed and were immediately isolated; these cases were mostly from companies composed largely of recruits, and these companies were inspected daily, so that new cases were quickly detected and spreading of the disease prevented. Purulent infections of the external ear were common, probably due to the dust and to swimming in the bay.

The drills and long hikes showed up many flat feet which had hitherto given little trouble, and they presented a real problem in separating the real sufferers from the malingerers; many complained of great pain and disability with very little deformity, while others with marked flattening and inversion had little trouble.

The need of an adequate dental corps was demonstrated daily; many teeth were extracted and hundreds of applications for the relief of toothache were made to the medical officers. The dentist on the U. S. S. *Solace* was overworked daily, yet a large number who were in great need of dental work had to suffer because of the lack of facilities. Ethyl chlorid, by the closed method, was given in a large number of cases for extraction of teeth and for minor operations; it proved very valuable for field work, being light, compact, easily given, safe, quick, and without disagreeable after effects.

On April 13, a sham battle was held. One regiment defended the Cuzco Hills, which were attacked by the other two. The Hospital Corps was organized as for actual battle; imaginary cases of various casualties received first-aid treatment and were transported by the litter squads to the field hospital for further treatment.

SPECIAL REPORT ON THE GENERAL SURGICAL DEPARTMENT, NAVAL HOSPITAL, NORFOLK, VA.

[Abstract from annual sanitary report, 1911.]

By Surg. H. F. STERN, United States Navy.

Four deaths occurred in the surgical wards during the year:

- (1) Carcinoma of the pancreas and colon.
- (2) Tubercular meningitis. Cushing's subtemporal decompression and lateral sinus aspirated. Intracranial pressure relieved and life prolonged.

(3) Cerebral syphilis uninfluenced by treatment. Cushing's subtemporal decompression for relief of intense intracranial pressure. Death 12 hours later from a ruptured blood vessel in a large softened gumma beneath floor of the lateral ventricle.

(4) Suppurative nephritis, both kidneys, following traumatic rupture of the deep urethra. External urethrotomy performed about 60 hours after the injury.

ANESTHESIA.

Ether by the open drop method has been the anesthetic employed for general anesthesia in major operations. Ether bronchitis occurred in 14 cases, but of a severe form in only 3 cases. Ether was administered in 253 cases. A simplified method of nitrous oxide administration will be observed with a view to replacing ether at this hospital.

PROPHYLAXIS OF WOUND INFECTIONS.

For simplicity and efficiency the following method, copied and introduced early in February, 1911, represents a distinct advance in securing prompt wound healing at this hospital:

Surgical wounds.—(1) Dry skin, dry shave, no scrubbing, and no bandaging; (2) patient anesthetized and placed on operating table; field of operation painted with full-strength tincture of iodine; skin soaked with the tincture; (3) wait five minutes, then place the sterile sheets; the field is now dark brown and ready for incision; (4) when the wound is sutured, remove the iodine with alcohol and gauze, i. e., decolorize the skin.

Since March, 1911, the above method has been used in all major cases and there has not been a case of infection. The wounds are dry and free from signs of irritation and there is no blistering of the skin. Full-strength tincture of iodine is used on the scrotum, but extra care is taken to remove all possible iodine with alcohol. To obtain uniformly good results these points must be emphasized: Dry skin; one thick application full strength; wait five minutes, and at the end of operation decolorize the skin with alcohol to prevent irritation. Other methods disregard one or more of the above requirements. Previous scrubbing, using weakened strengths and two applications were tried at this hospital and observed elsewhere, but were not satisfactory. Infections of the wound and dermititis followed too frequently.

Accidental wounds.—Of equal importance is the method used to secure prompt union in accidental wounds: (1) Stop hemorrhage and trim away lacerated tissue and skin. (2) Paint surrounding skin with tincture of iodine as above. (3) Thoroughly flush the wound with Harrington's solution; then irrigate with saline to remove the Harrington's solution. (4) Suture the wound and remove the iodine.

Where the wound is recent, primary union can be expected. The three most interesting cases of this nature during the year were:

(a) Compound fracture of the tibia and fibula, lower third, with fragments projecting, much laceration of tissue, tibialis anticus muscle crushed and completely severed. Operation five hours later, fragments wired. Primary union.

(b) Lacerated wound of hand, with compound fracture of two metacarpal bones. Primary union.

(c) Lacerated wound of scalp, 4 inches long, exposing the skull, which presented a 3-inch fracture. Operation four hours after injury. The scalp was shaved and the wound treated as above. The skull then opened and a large epi-dural clot removed. Union without a drop of pus followed. This case presents a good test. The patient fell from the fore-castle of the U. S. S. *Kansas* at Portsmouth, Va., striking his head on the anchor chain. He was rescued from the water in an unconscious state.

APPENDICITIS—PRACTICAL WORKING PRINCIPLES.

This article was written in reply to questions from the junior medical officers, the object being to give a uniform idea of the principles followed in managing appendicitis cases and, at the same time, to correct a few common errors in operative technique.

Cause.—Narrowed or obstructed lumen interfering with proper drainage of the distal end. Impacted faeces, causing erosion; later, scar tissue and stenosis.

Operate.—When the diagnosis is established. It is mere guess-work to predict the outcome of any acute case. Beginning gangrene or abscess formation is frequently seen with a temperature of 98° F., pulse 80. Rigidity of the right flank muscles is a very important sign; it may be the only definite clue to a postcaecal appendix with abscess.

The incision.—Keep external to McBurney's point, and split the internal oblique high, so as to clear the anterior superior spine. The advantages are most important:

(a) There is no dense outer leaf of external oblique aponeurosis interfering with exposure of the deep muscle.

(b) The high splitting of the internal oblique and transversalis can be extended far into the flank, thus securing an opening sufficient to remove any appendix, adhesion, or abscess, without cross-cutting muscle fibres.

(c) On opening the peritoneum, the large intestine is first seen. The small intestine is internal—usually the anterior longitudinal band is seen before incision is completed. All abscesses are thus approached externally.

To locate the appendix, secure the longitudinal band and work downward, never leaving it. If it disappears around the head of the

caecum, follow it, the appendix is postcaecal. In this way only can a hidden appendix be located without delay and undue intestinal manipulation. Finding the longitudinal band is finding the appendix. When the base is found, locate the tip, if there are massed adhesions, and work backward; the reverse order of delivering such an appendix is delicate work, for the friable appendix, stripped of its peritoneal coat, is very liable to break. Working from the tip, the adhesions will gradually melt away, and if they do not, clamp and cut, always tying what you cut.

Removing the appendix.—Remove the appendix in every case. If there is an abscess, first mop the cavity dry and get the appendix. The exception, of course, would be where the patient's general condition would not permit more than a quick incision and drainage. The peritoneum, assisted by Fowler's position and Murphy's proctoclysis, will take care of the new areas of infection opened up. The source of infection removed, the wound heals quickly, and troublesome postoperative adhesions do not form. A good percentage of unremoved appendices give further trouble, a very large percentage form dense, painful adhesions interfering with peristalsis. A secondary appendicectomy is frequently one of the most tedious operations in abdominal surgery. Ligate the base close to the caecum, cut, leaving only enough tissue to hold, remove pouting mucous membrane and touch with carbolic, waiting before neutralizing until stump whitens. Purse string inversion of the stump is unnecessary and prolongs the anesthetic.

Drainage.—Do not drain unless there is actual pus outside the appendix. In abscessed or ruptured appendix, mop dry, introduce one large soft rubber tube to the bottom and close the wound tightly about it. Remove the tube at the end of 36 hours and introduce a gauze wick to drain the bottom of the tract, remove it 24 hours later and discontinue drainage. At the end of 36 hours the peritoneal cavity is firmly walled off from the tube, and if it is left longer it only acts as a foreign body to prevent healing, to increase the discharge, and frequently to ulcerate through the bowel. Packing in gauze is a surgical crime, except rarely to control bleeding. It is difficult to remove until late, interferes with healing, causes adhesions, and does not drain after 12 hours. "Walling off" with gauze during the operation serves only to keep the intestines and omentum out of the way; pus can not run back into the peritoneal cavity; there is no space. This only happens when pus is under pressure, as when the abdominal cavity is closed.

Remember that slow operative technique adds risk to the patient. Save time by fast work in exposing the peritoneum, by not inverting the stump and in closing the wound. Work carefully in opening the peritoneum, breaking down adhesions, ligating the meso-appendix,

and treating the stump. A post-operative clot about the stump is very likely to become infected. The muscles are usually tied too tight, and the included fibers are destroyed.

Post-operative treatment.—Clean cases can assume any position in bed that is most comfortable. No morphine; it produces troublesome tympanites and makes the use of the catheter necessary. If anything is required, give aspirin. Water frequently after 12 hours. High turpentine enema the day following the operation. Stitches out on the eighth day, wheeled chair on the tenth day, walking on the eleventh day.

Drainage cases should have the same post-operative treatment as clean cases except for Fowler's position and Murphy's proctoclysis. Fowler's position means three-fourths Fowler's as soon as out of the anesthetic. Murphy's proctoclysis means saline dropping into rectum at least six inches from anus, 70 to 80 drops per minute at a temperature of 100° F., started as soon as the patient gets back to bed. These cases get up on the tenth day as do clean cases; there is only a skin wound healing.

AMERICAN PUBLIC HEALTH ASSOCIATION MEETING.

The thirty-ninth annual meeting of the American Public Health Association was held at Habana, Cuba, December 5 to 11, 1911, inclusive. The Medical Corps, United States Navy, was represented by Passed Asst. Surg. Wm. H. Short, United States Navy; from his report the following is abstracted:

The object of this association is the development of the science and art of public hygiene and the promotion of public hygiene as a distinct profession. Active membership is accorded to those who have been for a period of three years engaged in active professional practice of technical branches of public hygiene; those who have been on the executive or technical staffs of Government departments in the United States, Canada, Mexico or Cuba for a period of three years; those who have been associate members for, at least, five years; foreign members recommended for active membership by the advisory council.

During the present meeting a new section was added to the constitution, viz:

"Any Federal, State, or municipal department, bureau, or service, and any association or other organization in any of the countries represented in this association engaged in the conservation and promotion of public health, may upon application be elected to membership."

Duly appointed delegates from such departments, services, or associations may present papers approved by the program committee of this association and engage in the discussion of papers read at its regular meeting.

I was very favorably impressed with the interest, sincerity, and energy shown by the members of this association in the enormous scope for their endeavors.

The general association is divided into sections consisting of groups of members having a special interest in some particular branch of public health work; its members are located in United States, Canada, Cuba, and Mexico. The medical service of the United States Army and the Public Health and Marine-Hospital Service likewise take an active interest.

Membership in a section is optional with members of the general association. At present there are three sections, viz, laboratory, vital statistics, municipal health.

Sections on sociology and sanitary engineering are in process of development.

The officers of the general association, elected December 8, 1911, to serve during the ensuing year, are: President, Dr. John Hurty, Indianapolis, Ind.; vice president, Dr. Frederico Torralbas, Habana, Cuba; second vice president, Dr. Alexander J. Douglas, Winnipeg, Canada; third vice president, Dr. Carlos M. Garcia, Vera Cruz, Mexico; treasurer, Dr. Frank W. Wright (reelected), New Haven, Conn.; secretary, Dr. William C. Woodward, Washington, D. C.

The general association met during the morning hours and the section meetings were held in the afternoon; the papers read before the general association were limited to 15 minutes.

More than 50 papers were presented, and the scope and importance of the subjects treated may be indicated by a few of the titles, as follows:

Annual Report of Yellow Fever in the Republic of Mexico. By Dr. Eduardo Liccaga, president superior board of health, Mexico.

Report on Typhoid Fever in Richmond, Va., during 1909-10. By Dr. Ernest C. Levy, chief health officer, Richmond, Va.

The Treatment of the Baltimore Drinking Water by Calcium Hypochlorite. By Dr. William Royal Stokes and Dr. Frank W. Hachtel, Baltimore, Md.

Experimental Studies on the Action of Germicides. By Dr. E. C. Howe, New York, N. Y.

Report of Committee on Standard Methods for the Bacterial Diagnosis of Tuberculosis. By Dr. Mazyck P. Ravenal, chairman, Madison, Wis.

Symposium on the exclusion of Asiatic cholera from North America in 1911:

- (a) Measures Taken by the Canadian Government to Prevent the Introduction and Spread of Cholera in the Dominion of Canada. By Dr. Frederic Montizambert, director general of public health, Canada.
- (b) Measures Taken by the Cuban Government to Prevent the Introduction and Spread of Cholera in Cuba. By Dr. Juan Guiteras, director of public health, Cuba.
- (c) Measures Adopted by the United States Government to Prevent the Introduction and Spread of Cholera in the United States. By Dr. John F. Anderson, director hygienic laboratory, United States Public Health and Marine-Hospital Service.

A Study of Air and Contact Infection at the Providence City Hospital. By Dr. Charles V. Chapin, superintendent of health, Providence, R. I.

Report of Committee on Education of the Public as to the Communicability and Prevention of Gonorrhea and Syphilis.

The Hygiene of Swimming Pools. By Dr. E. J. Tully, Madison, Wis.

A Bacteriological Study of the Milk Supply of Washington, D. C. By Dr. J. J. Kinyoun and Dr. Louis V. Dieter, Washington, D. C.

Report of the Committee on Standard Methods for the Examination of Air. By Dr. C. E. A. Winslow, chairman, New York, N. Y.

Fly Extermination in Cities. By Dr. C. E. Terry, city health officer, Jacksonville, Fla.

The North Carolina Campaign Against Hookworm Disease, by Dr. John A. Ferrell, North Carolina State Board of Health.

The Conservation of Food Products by Refrigeration, in its Hygienic and Economic Aspect, by Dr. P. H. Bryce, chief medical officer, department of the interior, Canada.

Sanitary inspection of the Canal Zone, by Dr. A. J. Orenstein, assistant chief sanitary inspector, Isthmian Canal Commission, Ancon, Canal Zone.

In view of the fact that the object of this association is the conservation and promotion of public health, and that, at the annual meeting, papers are read and discussed concerning especially endemic and epidemic diseases, preventive medicine, and hygienic conditions in various parts of the Western Hemisphere, the proceedings of this association are of particular interest to medical officers of the Navy. As the next annual meeting is to be held in Washington, D. C., it is to be hoped that a number of medical officers may be in attendance.

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VOL. 6

NO. 3

UNITED STATES NAVAL MEDICAL BULLETIN

PUBLISHED FOR THE
INFORMATION OF THE MEDICAL
DEPARTMENT OF THE SERVICE

UNDER THE SUPERVISION OF
SURGEON GENERAL C. F. STOKES
U. S. NAVY

EDITED BY
SURGEON T. W. RICHARDS, U. S. NAVY
AND
PASSED ASST. SURGEON J. L. NEILSON, U. S. NAVY

JULY, 1912
(ISSUED QUARTERLY)



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Page 12

U.S. GOVERNMENT PRINTING OFFICE

NAVY DEPARTMENT,
Washington, March 20, 1907.

This United States Naval Medical Bulletin is published by direction of the department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.

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P R E F A C E .

The publication and issue of a quarterly bulletin by the Bureau of Medicine and Surgery contemplates the timely distribution of such information as is deemed of value to the medical officers and the Hospital Corps in the performance of their duties, and with the ultimate object that both shall continue to advance in proficiency in respect to all of their responsibilities.

It is proposed that the Naval Medical Bulletin shall embody matters relating to hygiene, tropical and preventive medicine, pathology, laboratory suggestions, chemistry and pharmacy, advanced therapeutics, surgery, medical department organization for battle, and all other matters of more or less professional interest and importance under the conditions peculiar to the service and pertaining to the physical welfare of the naval personnel.

It is believed that the corps as a whole should profit, to the good of the service, out of the experience and observations of the individual. There are many excellent special reports and notes beyond the scope of my annual report being sent in from stations and ships, and by communicating the information they contain (either in their entirety or in part, as extracts) throughout the service, not only will they be employed to some purposes as merited, but all medical officers will thus be brought into closer professional intercourse and be offered a means to keep abreast of the times.

Special attention will be given by the instructors of the Naval Medical School to the review of advances in medical science of special professional interest to the service, as published in foreign and home journals, and extracts from these will appear in the bulletin, together with such remarks as the instructors may deem of value to officers on foreign service or sea duty.

Information received from all sources will be used, and the bureau extends an invitation to medical officers to prepare and forward, with a view to publication, matter on subjects relating to the profession in any of its allied branches. But it is to be understood that the bureau does not necessarily undertake to indorse all views and opinions expressed in these pages.

C. F. STOKES,
Surgeon General, United States Navy.

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U. S. NAVAL MEDICAL BULLETIN

VOL. VI.

JULY, 1912.

No. 3.

SPECIAL ARTICLES.

LEPROSY.

With notes on and illustrations of the cases as they occurred in the Tumon Leper Colony, Guam, Marianas, during the months of October and November, 1911.

By Asst. Surg. W. M. KERR, United States Navy.

Leprosy is a chronic, general disease caused by the *Bacillus lepræ* Hansen which produces characteristic lesions in the skin, mucosæ, and nerves. At the present time there is occasionally great difficulty with regard to the differentiation of leprosy from similar diseases, and therefore in former years before the discovery of the lepra bacillus by Hansen (1871), syphilis and various skin diseases were without doubt confused with it. Hence the history of the disease is not easily traced. It is first mentioned in Egyptian writings of a period three or four thousand years before Christ, and from Egypt it probably spread to Greece, and later to Italy by means of Roman troops. It was disseminated throughout Europe by soldiers, traders, and perhaps by crusaders returning from the Holy Land. It increased in Europe to such an extent that in the twelfth and thirteenth centuries Governments and various religious orders made heroic efforts to stop its ravages. Lepers were isolated in lazarettos and stringent laws were passed governing their movements, dress, and mode of life. The result of this must have been beneficial, as the number of lepers is said to have diminished rapidly in the fourteenth and fifteenth centuries, and now the disease has almost disappeared from many parts of Europe. It prevails in Iceland, Norway, and Sweden, parts of Russia, particularly about Dorpat, Riga, and the Caucasus, and in certain parts of Spain and Portugal. It is widely spread amongst the tropical and subtropical parts of Asia and throughout almost all Africa. In North America there are several important foci: Louisiana, in which the disease has been known since 1785; Minnesota, where it was introduced by Scandinavian colonists; New Brunswick, the West Indian Islands, and portions of

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the Pacific slope. In India, Japan, and China the disease is most ancient. During recent years the Chinese leaving their native land are accredited with introducing the disease into Hawaii, Polynesia, California, Australia, and New Zealand.

It is impossible to say when leprosy was first introduced into Guam, or from whence it came; but it is known that the Spanish maintained a colony for the isolation of the lepers of that island for many years, first on the island called Tinian, one of the Marianas group, and later at Pago, and at Asan in Guam. When the Americans took possession a colony was established on the shore of Tumon Bay, and in it were confined a number of lepers and leper suspects. As time went by, death and the liberation of suspects proven to be nonlepers, decreased the number of inmates until at the present time 24 people (18 men and 6 women) are confined therein.

The *Bacillus lepræ*, the cause of this disease, has great resemblance to the tubercle bacillus and is stained by the same methods (carbol-fuchsin, etc.) although it is less acid-fast.

Cultivation has until recently failed, but in 1909 Clegg announced the successful prolonged cultivation of this organism on artificial media. He obtained his results by growing lepra bacilli in symbiosis with amœbæ and the spirillum of cholera. Duval and Gurd, writing on the biology of and the immunity against the bacillus of leprosy state that it may be cultivated on a variety of artificial media, and is capable of living and retaining its infectibility for months under adverse conditions outside the body. They claim that the bacilli can be cultivated from contaminated leprous tissue and from the nasal discharge that has been kept at room temperature for more than a year. Contaminating organisms apparently have no appreciable effect on the viability and infectivity of the lepra bacilli. Pure cultures can be obtained directly from the infected leprous tissue on a variety of special media, including tryptophan and glycerinated blood agar, without first growing them in the presence of amœbæ and their symbiotics. Primary multiplication takes place slowly on artificial media, but once the growth has started it can be readily accelerated by frequent transplantations. That the cultures are leprosy bacilli, and not some other acid-fast organism, they state, has been proved by animal and cultural tests. Duval writing on the cultivation of the leprosy bacillus from the human tissues, at a slightly later date, concludes that in the cultivation of *Bacillus lepræ* the initial multiplication outside the body can not be obtained unless amido-acids are present in the medium. These acids are believed to be essential nutritives for the initial growth of the organisms. He states that it has been demonstrated that the primary growth of the leprosy bacilli occurs only in the presence of the products of tryptic digestion; hence, putrefactive

and other bacteria which are capable of splitting nucleo-proteids into their end acid products are, in consequence, of value in the isolation and cultivation of the leprosy bacilli. Amœbæ are not necessary for securing the primary multiplication of the leprosy bacilli upon artificial media and are, in fact, detrimental as they feed upon the bacilli themselves.

Two methods may be employed for recovering, in culture, bacillus lepræ from the tissues. In one (the direct), tryptophan or a mixture of albumen and trypsin are employed with a culture medium; in the other (the indirect), bacterial species capable of digesting the albumen constituent of the culture medium are introduced into it. In both the end result is identical, since they both provide for the presence of the amido-acids in the medium, without which the primary multiplication of the leprosy bacilli can not be secured.

By successive injections of a pure culture of the lepra bacillus Duval has succeeded in producing in the monkey a type of disease very similar to the human form, and in recovering acid-fast bacilli from the remote lesions. White and Japanese dancing mice have also been successfully infected. The difficulty which attends animal inoculation with the lepra bacillus is in marked contrast with the ease with which the tubercle bacillus grows in animals.

The bacilli exist practically all over the body wherever diseased tissue is found. They probably leave it principally by the nasal secretion or the discharge of disintegrating tubercles. Leprosy is not highly contagious and the manner of its dissemination is unknown. There can, however, be no doubt that the disease is spread in some way from man to man, as evidenced by the prophylactic success of the isolation of lepers, but just how infection takes place is an unsolved problem. In the well-known case of Arning, a prisoner, Keanu by name, was inoculated with a leprous nodule that had not broken down into an ulcer. He developed leprosy, but he had been in contact with lepers in his own family and in prison (Swift). Furthermore, he was a Hawaiian, and the mathematical probabilities of one of these people developing leprosy under ordinary conditions is high. A similar case is that of Coffin, also a prisoner, who purposely inflicted a wound in the skin and inoculated himself with leprosy, using as material the pus of a leprous ulcer. He developed leprosy but he had, before inoculating himself, been exposed to the disease. On the other hand, many alleged and authentic cases of human inoculation, performed usually by means of a wound of the skin, have failed to produce leprosy. In studying the literature a striking point is the large number of lepers that give a history of personal contact of the most intimate character with a leper for a long or short period previous to developing the first symptoms of the disease.

This question of close intimacy has a bearing on the possible indirect transference of the lepra bacillus from one person to another by means of bloodsucking insects. Currie, working in Hawaii, obtained negative results as far as the mosquito is concerned. He examined 493 blood-filled mosquitoes which had fed on lepers, but was unable to find acid-fast bacilli in any of these insects. Sands, in South Africa, experimented with the common fly (*Musca domestica*), the common flea (*Pulex irritans*), the local varieties of mosquito (*Culex* and *Anopheles*), and the bedbug (*Acanthia lectularia*). These insects were starved for a period of 24 hours to 20 days. They were then placed in a watch glass or fine wire mesh frame which was fixed by means of adhesive plaster to a leprous area. The hungry insects fed on blood or exudation from these areas, and smears of insects so fed, made within half an hour of feeding, gave the following results: Seventy flies, inclosed over ulcerated leprotic surfaces—2 acid-fast bacilli found in the stomach of 1 fly and 1 in the stomach of another; 80 mosquitoes—1 contained 3 acid-fast bacilli; 60 fleas—2 contained acid-fast bacilli (2 bacilli in 1 flea and 1 in the other); 75 bedbugs—20 contained acid-fast bacilli.

A large number of bedbugs known not to have fed on leprous subjects were examined and no acid-fast bacilli were found. According to these findings lepra bacilli are undoubtedly imbibed by the bedbug and are demonstrable without much difficulty from the debris of the intestinal canal. At least acid-fast bacilli showing the morphological characteristics of the lepra bacillus were found. They were usually isolated, but as many as 12 were counted in one field. They did not disappear readily, being found up to 16 days after the insects were fed. These bacilli were also found in clumps in the body tissues of one bedbug, and they were very similar in appearance to lepra bacilli cultivated by Clegg's method. Goodhue of Molokai, and Long of Basutoland also have found the lepra bacillus in *Acanthia lectularia*. Bedbugs are practically universal in their distribution, and thus they may readily be an important etiological factor.

Since the sixteenth century hygienic principals and sanitation have been more and more practiced in Europe. Personal and domestic cleanliness have been more indulged in, doubtless to the detriment of the bedbug. This fact, together with the attempt at segregation of lepers, would tend to have diminished the infected material for the bugs to feed on, as well as diminishing the number of bugs which might be practical agents in diffusion. Hence the gradual disappearance of leprosy from Europe can be explained. The bedbug theory explains many otherwise inexplicable details. For instance, the well-known immunity of officers and nurses in asylums. The bedbug frequents their rooms or beds, and only comes out to feed at night. The officers and nurses do not sleep with or in the same room as the

patients and, consequently, are not liable to be bitten by infected bugs. Also, the cases which have occurred among Americans or Europeans, either when in endemic regions or after having returned home, are nearly always amongst those men who have lived with native women or who have slept in native houses. It is thought by some that such indirect infection is accidental and exceptional, and that direct infection is the rule, perhaps by the lodging of bacilli contained in the inspired air on the nasal walls. This assumption is based on the fact that the earliest and most constant symptom is a nasal ulcer which is situated on the nasal septum at the junction of the cartilaginous and bony portion. From these ulcers numbers of lepra bacilli may be obtained. Among 1,200 cases taken in regular order at Culion in the Philippine Islands, Heiser found these ulcers in 799, and it is probable that if the remaining septa had been examined microscopically, scar tissue would have been found which would have been strong presumptive evidence that ulcers had existed.

There is no primary lesion in leprosy comparable to the chancre of syphilis, yet it is possible that in some cases the point of entrance of the bacilli is some abrasion of the skin around which the first leprosy lesion forms. Sandes reports a case in which this possibly occurred.

The period of incubation has no parallel, as regards length of time, with any other infectious disease. Cases have been cited in medical literature showing that it may vary from a few months to many years. On arrival inside the body the bacillus probably lodges in a lymph space, and there grows and forms colonies from whence it is scattered throughout the body by the blood or lymph. The multiplication of the bacilli in the body is so great that there are few diseases which show an equal infection.

The pathogenesis of the lesions is not very well known. The early stages have been studied by Unna, who states that there is first a dilation of the capillary vessels of the skin and on the walls of these vessels the bacilli can be found. The organisms then pass into the walls of the vessels and appear to irritate the connective tissue cells of the vicinity, which become plasma cells, and surround the periphery of the vessel. This early stage has not been seen in the typical leproma, in which the bacilli from the first are met with in the lymphatics in which they grow profusely, causing considerable dilatation, which is a marked feature of the lesions. After the early stage comes a phenomenon concerning which there is much difference of opinion, for either the plasma cells increase in size and, becoming multinucleated, engulf the bacilli, forming in this way the typical "lepra cells" of Virchow, or the bacilli attack the plasma cells, destroy their cytoplasm, and so damage the nucleus that it becomes achromatic and breaks into pieces, which remain surrounded by or on one side of a mass of bacilli embedded in mucus, thus giving rise

to a false appearance of a giant cell (Unna's theory). The lesions show these large cells—the "lepra cells" containing large masses of bacilli—but, in addition to these cells, there are also masses of bacilli embedded in mucus and not inclosed in cells.

The bacilli do not invade the surface epithelium nor the layer of the cutis immediately below this. The typical leproma, therefore, shows, superficially, normal epithelium, with the exception that there are few or no interpapillary processes. Below the epithelium there is a layer of connective tissue free from bacilli, under which lies the typical lesion, composed of lepra cells, plasma cells, connective tissue cells, and, according to some observers, a few polymorphonuclear leukocytes, separated by a very slight amount of fibrillar connective tissue and containing vessels whose walls are thickened by an infiltration of all the coats to such an extent that at times the lumen may be obliterated, while the lymphatic spaces are dilated and filled with bacilli.

The bacilli also may enter into the nerves and cause a hyperplasia of the connective tissue cells of the coats and the formation of typical leproma cells at first around the vasa nervorum, and later in the perineurium and endoneurium. These cells press on the nerve fibers, causing a degeneration of the neurilemma and later a disintegration of the arteries and destruction of the nerve fibers. It is usually considered that the peripheral nerves only are affected, but recently it has been shown that the bacilli attack the anterior cornua of the spinal cord, and, therefore, this may play a part in the production of the symptoms.

The skin lesions which may be found are the tubercles or nodules, which may or may not be ulcerated, the pigmented and the nonpigmented areas or macules. On cutting into the nodular leproma, it is seen to be situated usually in the cutis and covered by the epidermis; but it may lie in the subcutaneous tissue, in which case it does not form a projecting tubercle, and is more apparent to the touch than to the sight. It is yellowish-white in color, firm, and, if squeezed, a little clear or often cloudy fluid can usually be obtained which contains the lepra bacillus. The sweat and sebaceous glands and the hair follicles are compressed and as a rule atrophied. Vesicles and pustules may occur on the surface, which may be ulcerated and covered with crusts. The macules of the nodular type of the disease consist of round-celled infiltration with but few large cells, and they are generally free from bacilli. In the spots, which, during life, were anæsthetic, the corium is largely converted into fibrous connective tissue, which has caused glands and hair to atrophy and disappear. The typical lepromatous infiltration may occur in the mucosæ of the tongue, pharynx, larynx, epiglottis and in the sub-mucosæ of the intestine as well as in the skin. The liver, which is

usually enlarged, shows a leprous infiltration of the portal system, while the spleen, which may also be enlarged, shows the same condition along the course of its vessels. The ovaries and testes may show infiltrations and fibrosis of the interstitial tissue which destroys the secretory elements and causes the sterility which is marked among lepers. The lymphatic glands are often enlarged, infiltrated, and full of bacilli, especially the femoral. Nephritis and leprous infiltration of the kidneys occur, yet most observers state that the *lepra bacillus* is not found in the urine. The nerves most commonly affected are the palmar branch of the ulnar, the ulnar, the median, the peroneal, the posterior tibial and the great auricular. Osteomyelitis, necrosis, and absorption of the bones may be seen. Trophic changes in the joints and perforating ulcers are met with in the nerve form of the disease. In the circulatory organs, peri- and endarteritis and phlebitis occur. The blood contains the *Bacillus lepræ* generally in small numbers, which may be increased during periods of leprous fever or in very advanced cases. They may be demonstrated by the following method: Ten c. c. of blood are withdrawn from a vein under the strictest aseptic conditions. The blood is placed in a sterile test tube containing about 2 c. c. of sodium citrate solution, and the two fluids are gently mixed. The mixture is now placed in an ice box and allowed to stand undisturbed until the next day when it will be found that the red blood cells have fallen to the bottom of the tube and are covered by a layer of leukocytes. This leukocytic layer is carefully removed with a pipette and thick smears are made on glass slides. These are fixed by heat on a copper plate for 18 to 24 hours. The hæmoglobin is then dissolved out of the red blood cells by allowing the slides to stand in beakers of distilled water until no color is perceptible. The slides are then stained with carbol-fuchsin for five minutes, carefully decolorized with 2 per cent acid-alcohol (HCl), and counterstained with aqueous methylene blue. The blood serum in the majority of cases reported gives a positive Wassermann reaction.

The exact incubation period is unknown. The method of invasion is likewise more or less unknown as the initial lesions and their symptoms coming on insidiously escape notice. Before the eruption appears in some cases, attacks of fever of an irregular character with more or less malaise, associated with headache and pains in different parts of the body, peculiar sensations of cold or numbness in various places, and abnormal local or general perspiration, have occurred. These attacks of leprotic fever without any definite signs of leprosy may occur at varying intervals for years and may represent a bacteræmia. In some cases, no history of fever is elicited. After the general dissemination through the body, the bacilli appear to lodge mainly in the skin, in the nerves, or in both. It is convenient, there-

fore, to distinguish two varieties of the disease, viz, tubercular or nodular leprosy, and maculo-anæsthetic leprosy, remembering that the distinction is artificial and that many cases show both forms.

Tubercular leprosy.—In one of the febrile attacks mentioned above, or often without fever, an erythematous diffuse or macular eruption appears on the face, limbs, or body. As the fever declines the eruption may disappear to reappear at some future rise of temperature, or it may thicken and finally after successive rises of temperature, form tubercles or nodules which are lesions projecting above the general surface of the skin or mucous membranes. In some cases the projection is so slight that the term macular eruption may be employed. The erythematous appearance of these lesions does not tend to disappear on pressure. Besides these there may be subdermal infiltrations which are more easily felt than seen.

The macules, which are often forerunners of the nodular formation, vary in size from a pea to the width of the hand or larger. Their borders may be sharply or poorly defined. They may clear up in the center and form circinate lesions or gyrate figures from a coalescence of several such rings. The serpiginous tendency is chiefly noted on the lower extremities. The centers of the macules may present a loss of pigmentation, while their borders are hyperpigmented. The macules may be hyperæsthetic or itchy at the outset. Sooner or later they become anæsthetic, the anæsthesia being most marked in the center, while the hyperpigmented border is supersensitive. The sites of predilection are the face, extensor aspects of the extremities, the buttocks and the back. These lesions are rare upon the palms, soles and the scalp. There is generally noticeable absence of sweating over the macules, and after a time there may be a branny desquamation. While the macules may remain for years unchanged, they are usually followed sooner or later by the formation of tubercles, or the symptoms of anæsthetic leprosy or both.

The nodules vary in size from a small shot to the size of a cherry or even larger. They are typical of the disease. Their color varies from a light-red or yellowish hue to a dark brown or reddish brown. The surface of the tubercles is generally glossy and greasy from an excessive sebaceous secretion; it may be hyperæsthetic or moderately anaesthetic, and shows as a rule an absence of hairs. In fact the falling out of the eyebrows due to tubercular infiltration constitutes one of the early symptoms of tubercular leprosy. They may form all over the surface of the body, but are most common on the face and limbs. In the former location they appear on the forehead, cheeks, alae of the nose, bridge of the nose, lobules of the ears, lips, and chin, and, as they increase in size, they totally alter the appearance of the patient by obliterating natural facial lines and forming new furrows between adjacent nodules; while at the same time in many cases the

hair of the beard and moustache and eyebrows drops out. For some unknown reason the scalp enjoys a remarkable immunity to the ravages of leprosy, as it is never invaded by tubercles. The extensor surfaces of the extremities are commonly affected, particularly the backs of the hands, elbows, knees, and about the ankles. The palms and soles are very rarely the seat of tubercular infiltration. Upon the feet and ankles it is impossible to distinguish individual nodules, as the skin of this region is often the seat of a diffuse, hard edema, presenting the picture of true elephantiasis.

At frequent intervals during the course of the disease there occur exacerbations, with or without fever, during which it is noticed that the nodules become reddened, swollen, and tender. At the termination of these attacks some of the lesions are found to have decreased in size, while new tubercles will have formed in other localities. Ulceration of the nodules occurs more frequently in tropical countries, especially among the more ignorant and uncleanly class of patients. The ulceration may cover large areas at times and on healing leave nonpigmented scars that may be somewhat anaesthetic and are generally surrounded by a superpigmented border. These ulcerations together with abscess formation are generally the result of secondary infection, or are trophoneurotic; but not always, as is shown by the observations of Gurd and of Sugai, who have reported cases in which pus, containing no organism other than the leprosy bacillus, was found in the nodules.

Eye lesions are more commonly met with in this form of the disease. The superciliary region is early attacked and complete madarosis is not uncommon, and later paralysis of the frontalis muscle may set in. The eyelids are often attacked by diffuse or nodular lepromata, which may be extensions from the superciliary regions or may be distinct lesions. These may ulcerate, causing loss of the eyelids, or after cicatrization, lead to ectropion, entropion, and trichiasis. Nodules may form in the conjunctiva and subsequently ulcerate. A direct spread of the diseased process from neighboring regions to the globe is rare. Infection is much more common from the blood or lymph stream, and in this the peculiar arrangement of the vessels at the corneo-scleral margin and in its neighborhood is important. As the cornea is nonvascular, it can not be attacked primarily, but accordingly, as the bacilli pass in from the superficial or deep vessels the episclera is apt to become infiltrated along the external aspect of the corneo-sclerotic junction, resulting in pannus, or an interstitial keratitis. Primary nodules often occur at the limbus. The nodules which are found in the anterior chamber are from the uvea and the most common starting point of affection of the uvea is the root of the iris, in the angle of the anterior chamber. The leprosy changes in the choroid are generally in the anterior portion and thus readily escape notice. Lesions of the retina and optic nerve are rare.

The mucosae of the nose is generally attacked by ulceration with its attending epistaxis, or nodule formation with first blocking of the passage, and then, when the leproma extends down to the cartilage and ulcerates, falling in or destruction of the nose, with much disfigurement of the countenance, occurs, resulting from loss of tissue and cicatricial contraction. The tongue may also be affected, and show numerous tubercles separated by furrows, or it may be simply infiltrated. The walls of the mouth, the uvula, and pharynx may become lepromatous with attending difficulty in mastication and deglutition, while the same condition in the larynx causes voice changes and may impede respiration, especially if cicatricial contraction has followed ulceration.

The inguinal, femoral, and epitrochlear, and less often the axillary and cervical glands are enlarged and increase in size during the exacerbations of the disease. They are not as firm as the glands of syphilis and do not easily suppurate. A double epididymo-orchitis is fairly common and presents a compact mass with smooth or nodular surface, or a simple fibrosis of the testes may occur. Menstruation becomes irregular and stops. If the disease occur in young girls, menstruation may never begin.

In the early stages of the disease the blood shows no changes, but later it gives the picture of a secondary anemia. The number of leukocytes is generally normal. One observer (Bourret) reports an eosinophilia in all stages of the disease; however, if this observation be made in the tropics the eosinophilia is more likely due to intestinal parasites, which also cause a secondary anemia. The bacillus of leprosy is found free in the peripheral blood.

The nerves may become attacked, and the symptoms of nerve leprosy may be added to those of the nodular, forming the so-called mixed leprosy. Complications in the form of tuberculosis, amyloid disease, and nephritis are common. The mind is quite clear, but the patients are apt to be irritable, especially those confined in asylums or colonies. The course of tubercular leprosy is in most cases chronic, the average duration of life being 8 to 15 years. The most favorable termination of this form of the disease is a change to the anæsthetic type, in which case the symptoms ameliorate and the patient's life is often prolonged.

Maculo-anæsthetic leprosy.—In this form of leprosy the infiltration takes place principally in the nerves, causing at first irritation of the nerve fibers and later their destruction. The onset is insidious, and during the period of irritation or hyperæsthesia there are apt to occur such symptoms as shooting pains along the course of certain nerves, especially the ulnar and peroneal, accompanied by sensory disturbances, such as burning, tingling, numbness, formication, and various

vasomotor disturbances, as flushing of the face and glossy skin, and motor disturbances, such as twitching of the muscles, especially those of the face

After a varying period of time a macular eruption appears. This eruption is generally in the form of flat or light-colored spots of varying shapes and sizes, neither hyperæsthetic nor anæsthetic at first, and occurring generally without any febrile disturbance. Other spots may appear which, instead of being hyperæmic, are simply pigmented, while others may be found in which the normal pigmentation of the skin is less than usual. The macules are not due to the presence of bacilli, with accompanying round-cell infiltration in the skin, but to trophic or toxic action on the terminal branches of the cutaneous nerves, and therefore they are not so essentially a part of the morbid process as are the macules of tubercular leprosy; yet they show a greater variety of aspect especially in their form and coloring. They are more apt to persist and to clear up in the center, especially in the dark-skinned races, while the peripheries, which are usually raised and often marked with small papules or covered with dry, whitish scales, may coalesce with other spots, forming larger areas. The skin in these areas finally becomes anæsthetic and after a time the margins cease to advance, their elevation disappears, and the lesion becomes quiescent. In some cases the hair in these areas falls out, while in others it remains but turns white.

The symptoms in general of this type are those of a peripheral neuritis causing various sensory and trophic disturbances resulting in atrophy, in contradistinction to the hyperplasia seen in the nodular form; so while the maculæ are forming, the infiltration into the nerve trunks generally proceeds to such an extent that an often painful, swollen cord can be easily felt in certain localities, as behind the internal condyle of the humerus (ulnar nerve), over the mastoid (great auricular), and just below the head of the fibula (peroneal nerve). With the destruction of the nerve fibers, the hyperæsthetic stage ends and the anæsthetic stage begins. As a rule the anæsthesia is first found along the ulnar side of the hand and forearm, or on the inner side of the foot. The anæsthesia may be restricted to the trajectory of a nerve or it may be in patches, but late in the disease it generally involves the entire circumference of a limb. In some cases the intensity of the anæsthesia varies from day to day. There is often disassociation of sensation, that of temperature and pain disappearing, for instance, while the sensation of touch remains. Sensation may also be delayed, as when the touch of an object is felt after an interval of several seconds.

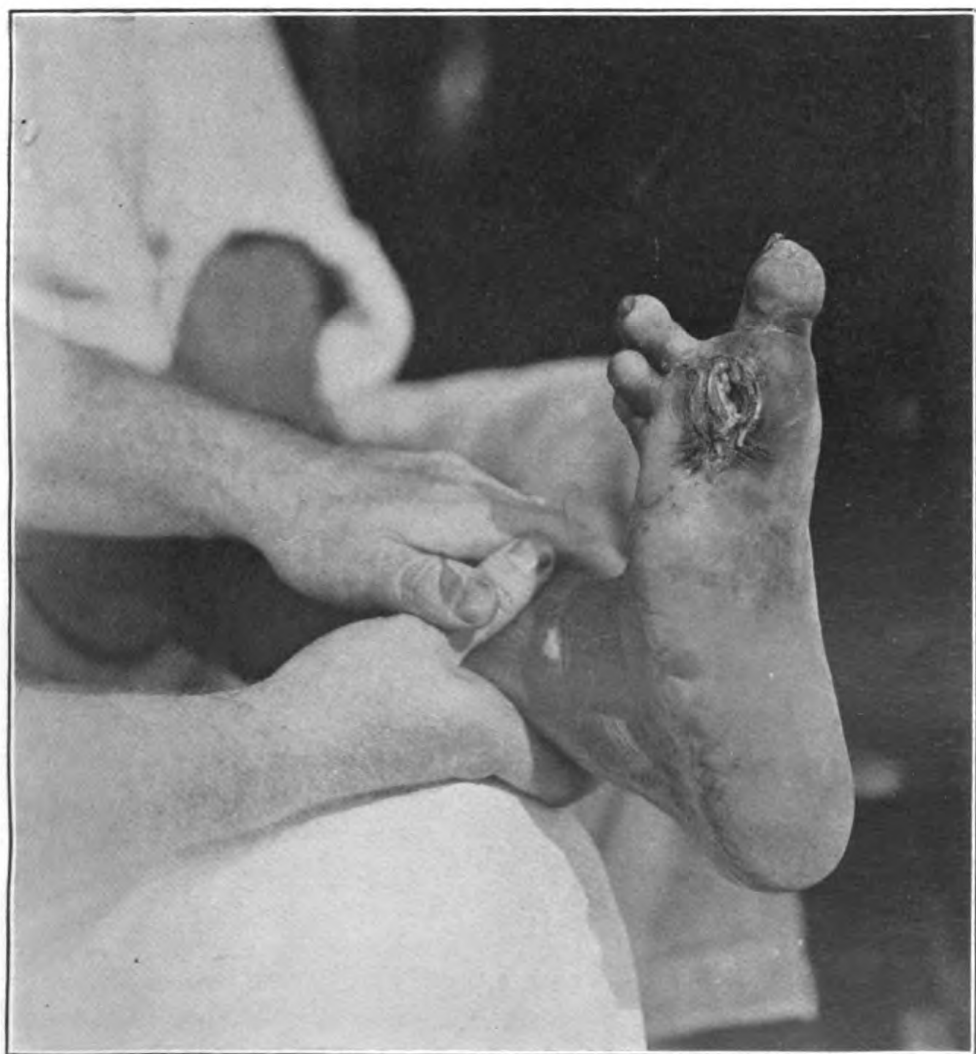
Simultaneous with the appearance of areas of anesthesia, some muscles begin to be paralyzed and to atrophy. This is especially

seen in the interossei of the hands and often of the feet. The paralysis and muscular atrophy resemble the Aran-Duchenne type of progressive muscular atrophy with the formation of "main-en-griffe." Sometimes the paralysis extends to the forearm with the production of wrist-drop. In the lower extremity the plantar muscles of the foot may be affected, while the spread of the paralysis to the peronei and extensors may result in a foot-drop with an internal twist. The superficial muscles of the face are frequently atrophied and can give the patient an appearance as characteristic as is the face of the tubercular leper. The eyes have a peculiar stare, and the lids often cannot be closed. The lips are flaccid and pronunciation of labials is difficult. The face becomes an expressionless mask, similar to that seen in paralysis agitans, and the patient's appearance is stupid or sorrowful. The reflexes are exaggerated at first, but when the paralysis begins they diminish.

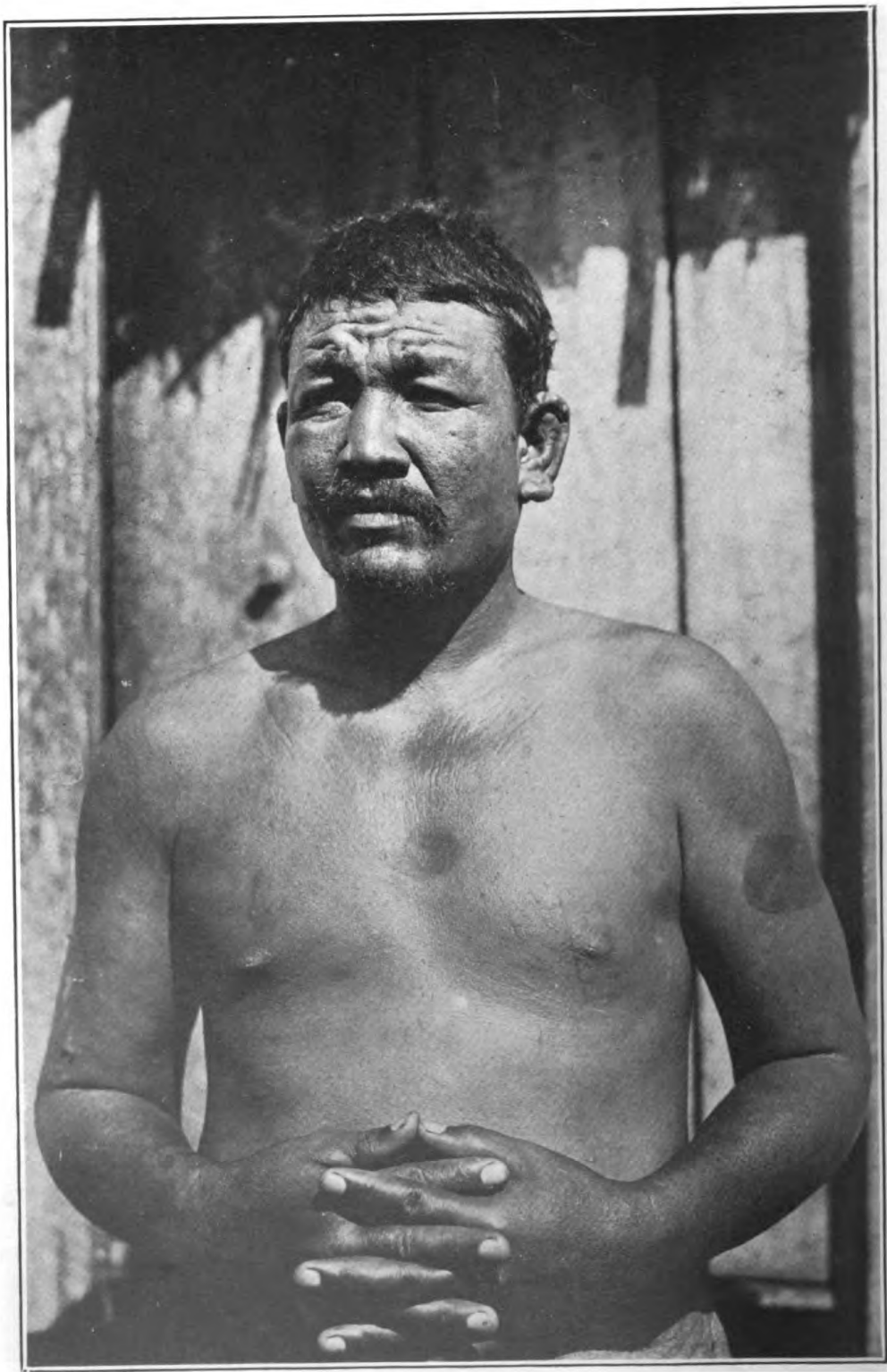
In some cases the process of anesthetic leprosy does not go beyond the production of muscular atrophy and tendinous retraction. In other cases, trophic lesions are common in the form of whitlows in the fingers and necrosis of the phalanges, or instead of this, a simple absorption of the bone so that the nail may ultimately appear to spring from the hand. Similar trophic lesions appear in the foot, and finally the hands and feet may become veritable stumps, the shape of the feet being compared to that of a pestle or a drumstick. Bullæ may appear on the hands or feet and when broken may form ulcers. Injuries to anesthetic areas may also result in ulcers which may be of the perforating type. Fissures may form in the fingers, hands, or feet, and dry gangrene may cause loss of these members. Trophic lesions of the elbow or knee, like Charcot's joints, have been described.

The eye is far less commonly affected than in the tubercular variety. True leprotic lesions are very rare, the eye being damaged by secondary infections due to the absence of the lachrymal secretion, and to paralyses of the frontalis, corrugator supercilii and orbicularis palpebrarum muscles which cause lagophthalmus and ectropion. Absence of the lachrymal secretion results in symblepharon and often desiccation and destruction of the cornea. Sterility is not so frequent in this form of the disease.

The course of anesthetic leprosy is decidedly chronic, the average duration of life being from 15 to 20 years. In some cases the process appears to come to a standstill and the patient is apparently cured. The skin may become involved early or late in nerve leprosy, thus forming mixed leprosy, which is a term used to include those cases of tubercular leprosy which develop nerve symptoms, and those of the maculo-anæsthetic form which develop nodules, as well as those



SHOWING TROPHIC PERFORATION IN LEPER'S FOOT.



CASE 1.

eases in which both nerve and skin lesions exist from the beginning and advance simultaneously.

As practically all of the described conditions exist in the 24 lepers confined in Tumon Colony under the care of medical officers of the Navy, it is thought that a report of these cases might be of interest, especially to those who some time in the future will be in charge of them.

Case 1.—V. P. R., nodular type. Born 1877 in Guam. Recluded May 23, 1910.

HISTORY: The patient believes his first symptoms occurred in 1895 when he had an attack of fever accompanied by headache and a chain of mental symptoms which he is unable to describe beyond the fact that "he was crazy." Similar attacks with the same set of symptoms occurred in 1898, 1902, 1907, and 1909, when he first noticed redness and thickening of both ears and a red indurated area below the right eye. After three weeks of fever, the redness disappeared but the patient thinks that the induration persisted. In the spring of 1910 the attack of fever with mental symptoms returned. The ears became red and slightly thicker, as did the spot under the right eye. At this time he noticed redness and thickening of portions of the skin of the forehead, cheeks, chin, and chest. At the termination of this attack he was pronounced a leper and confined in Tumon Colony. Since that time the redness of these spots has persisted, the induration has increased, and new areas have appeared. His relatives state that the mental symptoms took the form of marked irritability. No relatives and, as far as he knows, none of his acquaintances are lepers except J. B. (case 13), who lived in a house 3 meters distant, but with whom the patient was never intimate. (This illustrates the possibility of transference by vermin.)

EXAMINATION: The Wassermann reaction is positive. *Lepra* bacilli were found in smears from the nodules and from the nasal secretion. The scalp and eyes are normal. The nose shows a small ulceration of the septum. The mouth, tongue, and adjacent structures are normal. Both ears show marked enlargement due to leprous infiltration and nodular formation. There is marked induration of the forehead, especially of the superciliary region. The bridge of the nose, the cheeks, and the chin are infiltrated and nodular. The skin of both the upper and lower extremities, the chest, and abdomen presents numerous dark copper-colored, slightly indurated areas varying in size from 3 to 10 centimeters. These nodular and infiltrated areas show excessive sebaceous secretion. There is marked thinning of the eyebrows. No macules are seen. The liver and spleen are both enlarged and palpable. No nerves are involved. The axillary, epitrochlear, and inguinal glands are enlarged.

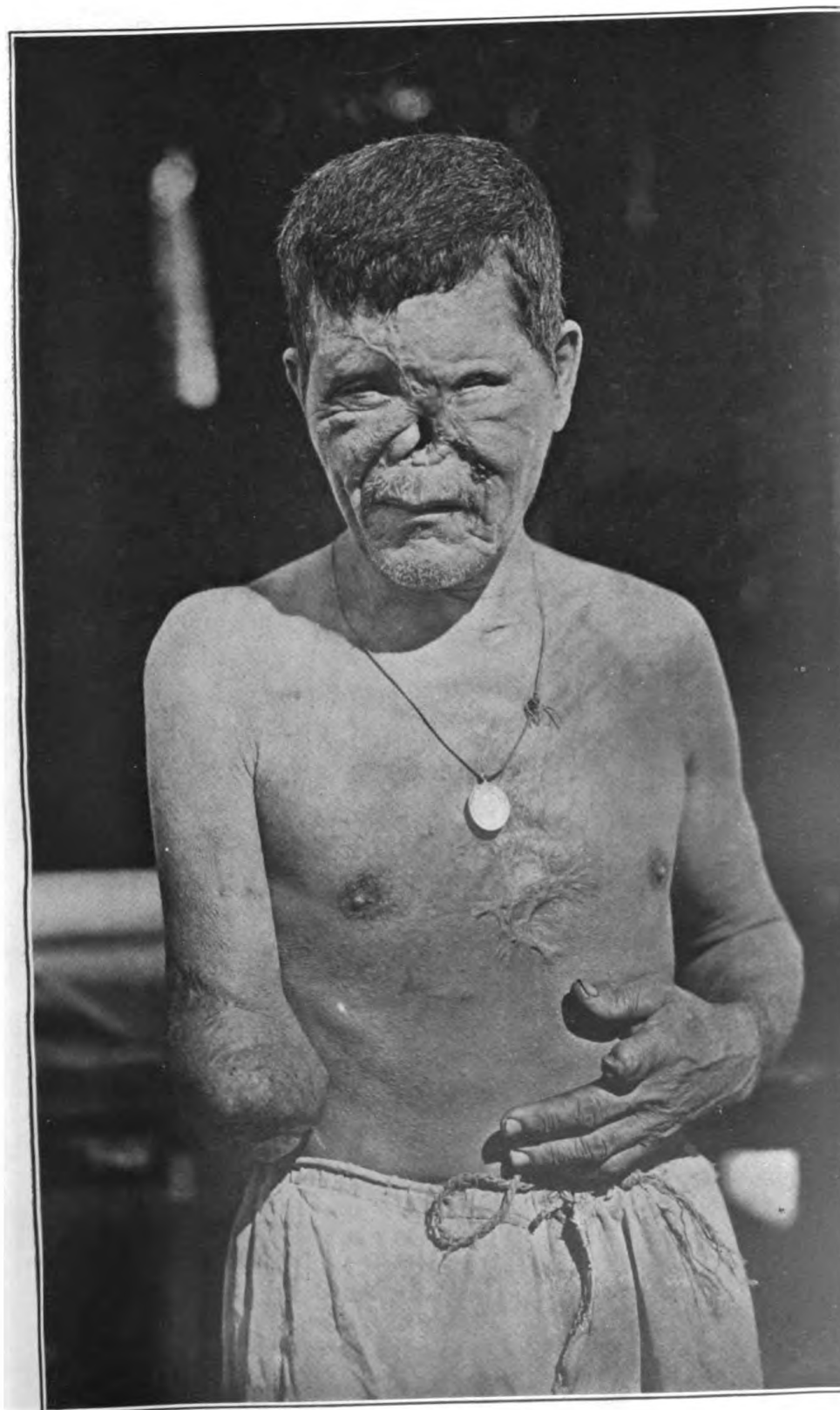
Case 2.—N. M., nodular type. Born, 1840, in Guam. Reclused, March 8, 1910.

HISTORY: In 1907, the left leg began to swell with a tense œdema. Later, the skin of the calf became thick, covered with dry scales, and of a reddish-brown color. The ankle joint became fixed. An ulceration which has persisted up to the date of this examination (October, 1911), appeared on the internal surface just above the ankle. Scrapings from this ulceration do not show the *lepra bacillus*. There is no involvement of the nerves. The Wassermann reaction is positive.

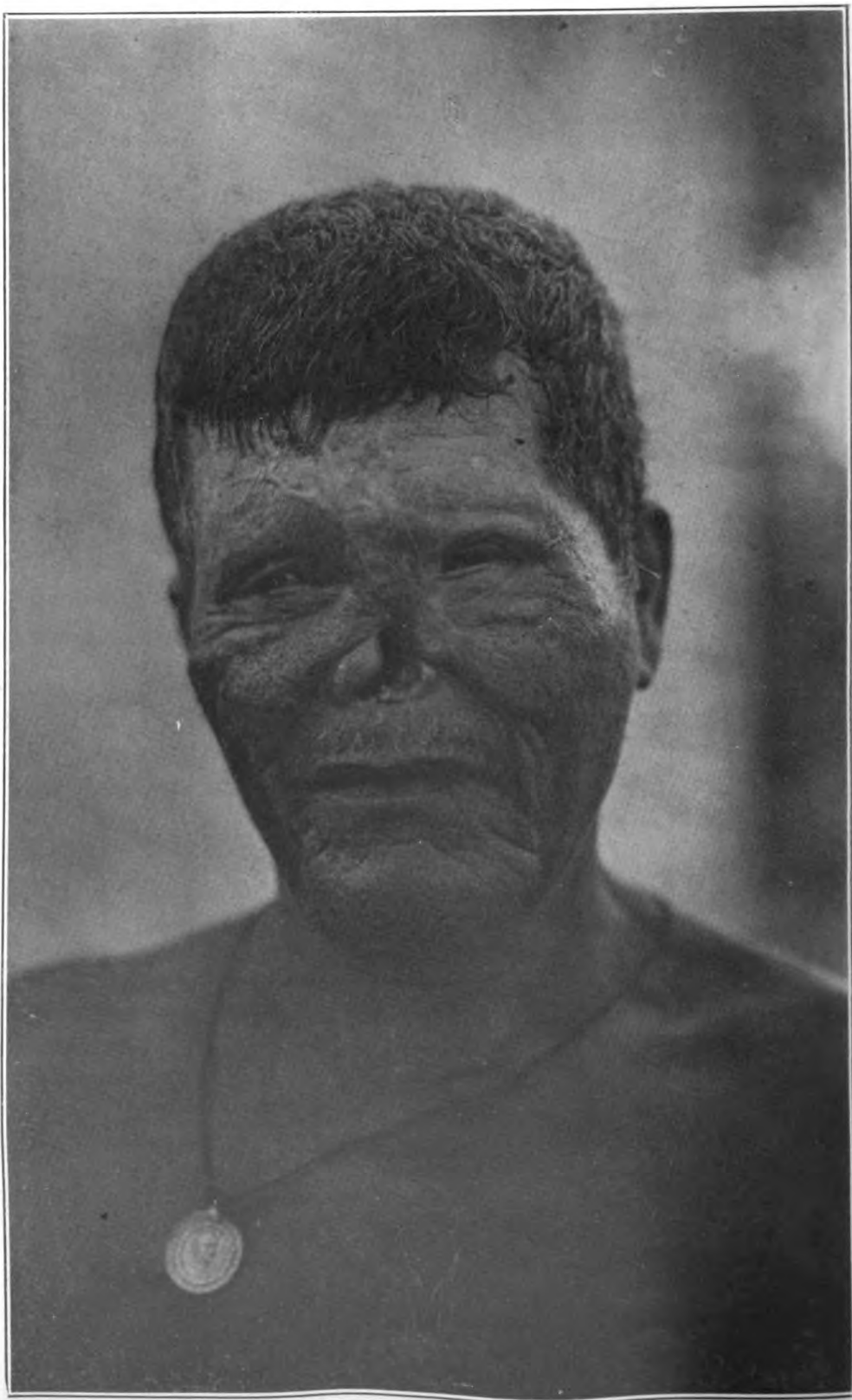
Examination shows only the changes in the left leg. *Lepra bacilli* were found in the blood, and upon this finding the diagnosis was made.

Case 3.—A. T., nodular type. Born, 1860, in Guam. Reclused, April 26, 1906.

HISTORY: The illness for which this patient was reclused in Tumon Colony began in 1897 with ulceration on the anterior surface of the left leg. This healed spontaneously in 1899 and left a smooth white scar. A large ulceration next appeared on his chest which healed spontaneously after several years. In 1904 his right forearm began to ulcerate, and the lesions proceeded to such a degree that amputation became necessary. At the same time an ulceration occurred in the nose, causing perforation of the septum and after some months complete destruction of the nose. From the nasal cavity a large ulceration extended out over the left malar bone. Its base was covered with yellowish, waxy detritus and discharged thin watery pus. The tissue immediately surrounding this ulcer was indurated to such an extent that the left eye was closed. No *lepra bacilli* have ever been found in scrapings from these ulcerations, and one blood examination was negative. The diagnosis of leprosy was considered doubtful by several medical officers who examined him at different times subsequent to his reclusion. In their opinion and in the opinion of the writer the ulcerations and loss of tissue were due to gangosa. The Wassermann reaction was positive. In September, 1911, he was given 0.6 gram of salvarsan intravenously, with the result that the ulceration on the cheek healed quickly, leaving a small linear scar to mark its site. This was taken as good therapeutic evidence in favor of the disease being gangosa. This man lived in close contact with the other lepers. In 1908 and again in 1910 he had attacks of fever, each lasting about one week. After the last attack a red hyperæmic area was noticed under the right eye. This was considered an extension of the inflammation about the ulceration on the opposite cheek. After the administration of salvarsan and the consequent disappearance of the ulceration, this red area was found to persist, and upon examination the skin was seen to be indurated. Scrapings from this lesion contained *lepra bacilli*. It would appear from the history that leprosy was contracted after his reclusion. Beyond the



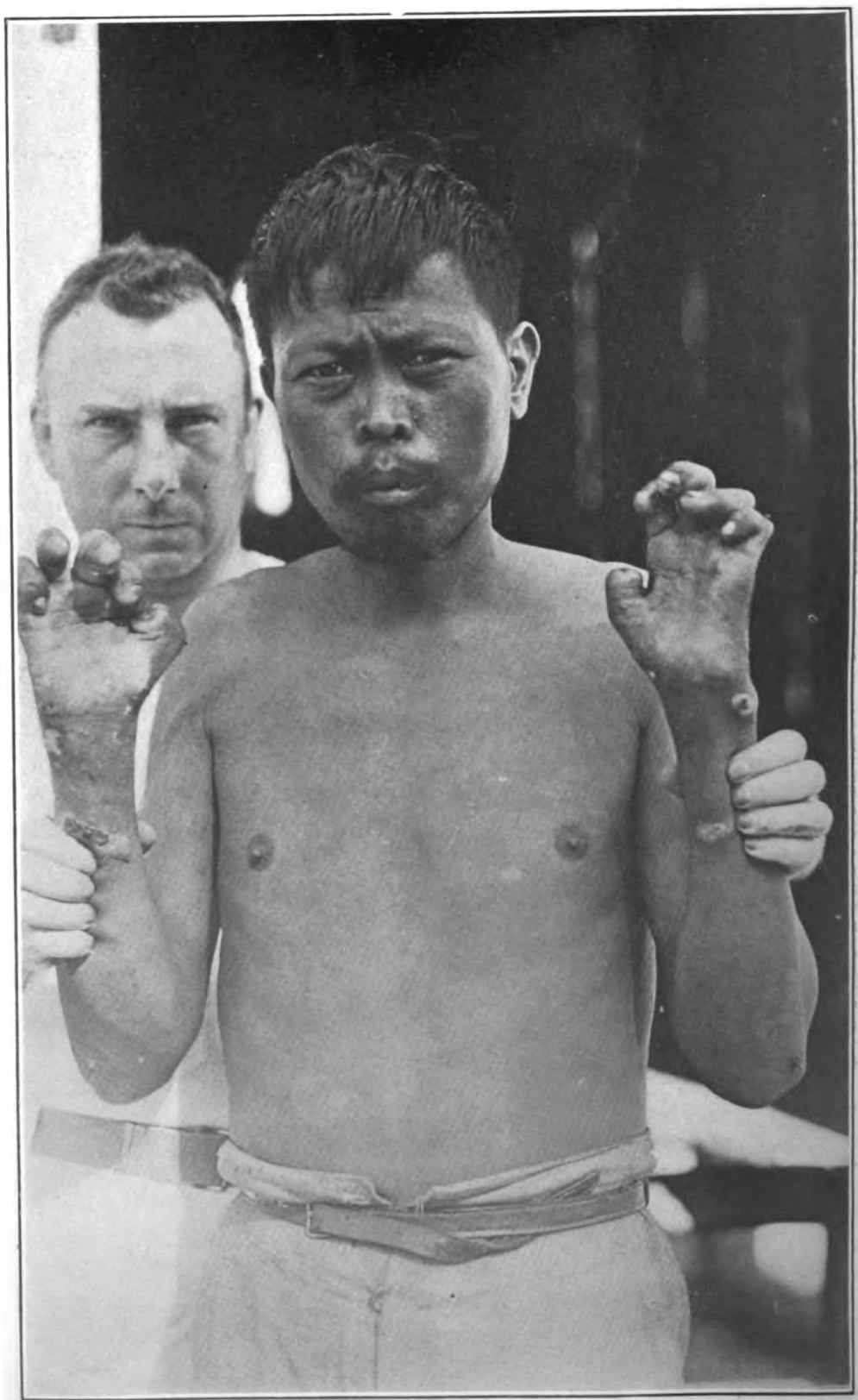
CASE 3.



CASE 3.



CASE 4.



CASE 5

one infiltrated area on the cheek under the right eye there are no evidences of the disease. None of his relatives are lepers.

Case 4.—R. T., maculo-anæsthetic type. Born, 1876, in Guam. Reclused, October 25, 1911.

HISTORY: Two years ago (1909) she had a fever which lasted about one week. Shortly after this she noticed tingling sensations in both hands and feet. Later, she began to have sharp shooting pains in both legs. Later still, they occurred in the forearms. She has never noticed any loss of sensation(?), but she burns her hands easily. As far as she knows no relatives or friends are lepers. Menstruation is normal. The patient has well-defined macules, which she states have existed only a few weeks.

EXAMINATION: The Wassermann reaction is positive. *Lepra bacilli* were found in the blood. The scalp is normal. The eyes show a slight arcus senilis. The nose, mouth, tongue, and adjacent structures are normal. There are no nodules nor infiltration of the skin. The right cheek shows a sharply defined, light-colored, anæsthetic macule extending from the eye over the cheek to the level of the nostrils. Similar macules of varying size and having superpigmented borders exist on the back of the neck, the left shoulder and back, the anterior surfaces of both arms, and on the right breast. There is loss of tactile, pain and temperature sense on the ulnar side of the right forearm, the ulnar border of the hand, the little finger, and the adjacent half of the ring finger. The left forearm shows a similar condition. Diminished sensation exists on the outer side of the right leg and foot, right little toe, and the adjacent half of the next toe. The inner side, the front, and portions of the back of the left leg are slightly anæsthetic. The dorsum and inner border of the left foot show delayed sensation. All of the skin not showing anæsthesia or diminished sensation, and the hyperpigmented borders of the anæsthetic macules are remarkably hyperæsthetic. On the bottom of both feet at the bases of the big toes are perforating ulcers due to pressure and trophic disturbances. The palms of both hands and the fingers show ulcerations due to burns. Perspiration is normal. Both ulnar nerves are enlarged and tender. There is no paralysis. The reflexes are exaggerated. The fingers show bone absorption and tendinous contraction. The femoral glands are enlarged. The liver and spleen are normal in size.

Case 5.—A. A., maculo-anæsthetic type. Born, 1880, in Guam. Reclused, April 28, 1906.

HISTORY: In 1905, the patient noticed that the sense of touch was diminished in his fingers. A little later he began to have tingling sensations in the toes of the left foot and at the same time his fingers became swollen and an ulceration occurred on one of the thumbs in which *lepra bacilli* were found. Shortly after his reclusion he was

troubled by shooting pains, first in the left and later in the right leg. In 1907 loss of sensation in both feet was first noticed. With the onset of this anæsthesia the pains in the legs diminished, but are still felt occasionally. He has had no febrile disturbances. At the time of his reclusion this patient was evidently of the mixed type of the disease, but at the present time he shows only the symptoms of the maculo-anæsthetic form.

EXAMINATION: The Wassermann reaction is positive. *Lepra bacilli* have been demonstrated in the tissues. The scalp, eyes, nose, mouth, tongue, and adjacent structures are normal. There are no nodules or infiltration. Light-colored, nonanæsthetic macules with a fairly well defined border occur on both cheeks, over the right clavicle, on the abdomen, on the extensor surfaces of both arms, on the lumbar and left inguinal regions. Both wrists and hands are anæsthetic on the palmar and dorsal surfaces. The skin over the left knee is anæsthetic. The left foot is anæsthetic below the ankle. The right foot is anæsthetic along the inner border, also the great toe, the second, third, and the adjacent half of the fourth toe. A perforating ulcer exists on the bottom of the left foot. Ulcers due to burns occur on the left hand. Perspiration is absent over the lower half of both forearms and hands, and over the left foot from a point just above the ankle joint. Both ulnar nerves are slightly enlarged. The reflexes are exaggerated. There is marked absorption of the bones of the fingers. The femoral and epitrochlear glands are enlarged, yet moderately soft. The liver and spleen are normal in size.

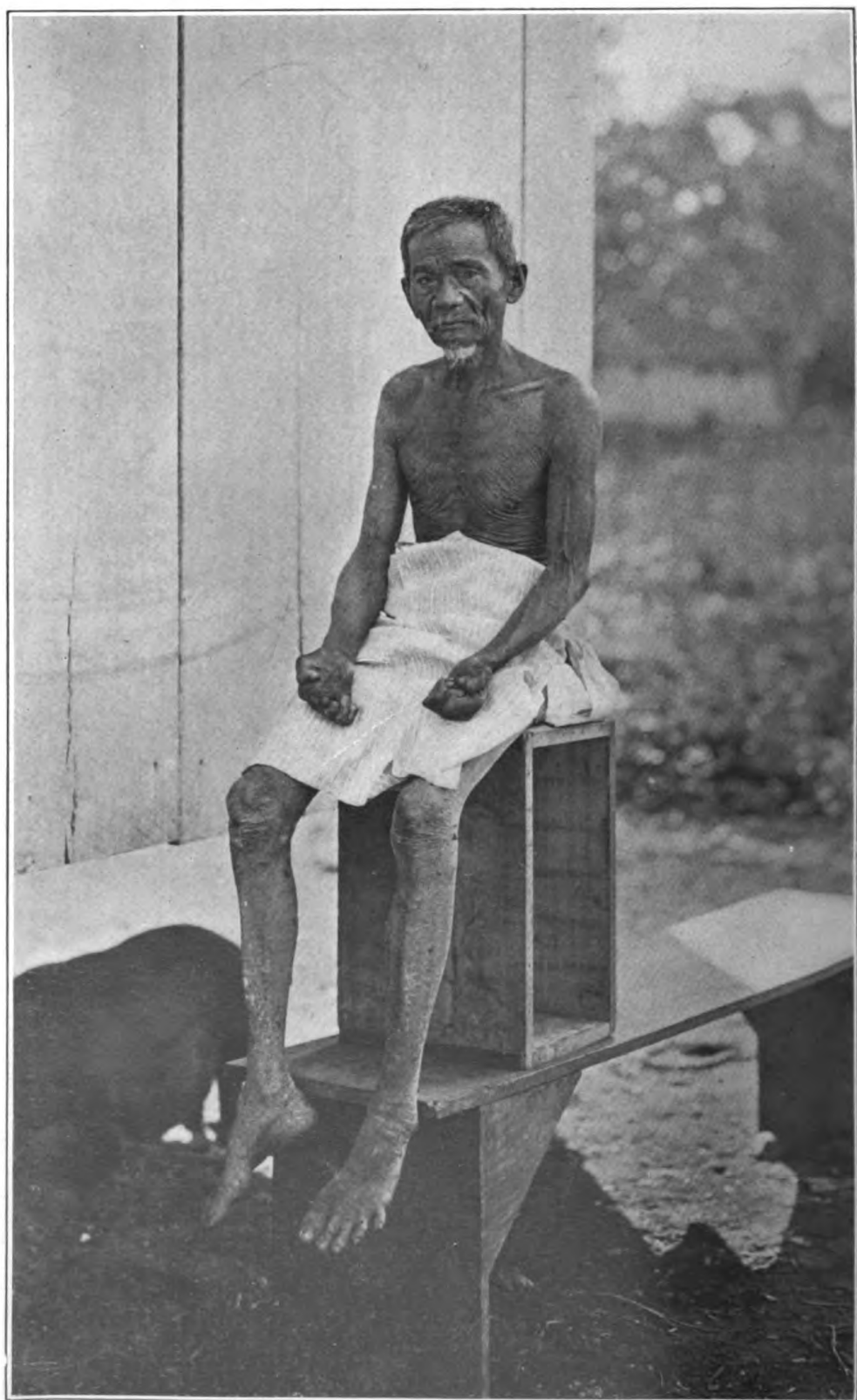
Case 6.—A. T., maculo-anæsthetic type. Born, 1826, in China. Reclused, March 8, 1910. No reliable history could be obtained. The Wassermann reaction is negative. *Lepra bacilli* were found in the blood, and upon this finding the diagnosis was made. Physical examination shows only marked atrophy of tissue in the left leg, the skin of which is dry, dark-colored, scaly, and is stretched tightly over the bone. There is contracture of the flexor tendons of the knee and ankylosis of the ankle joint. The foot shows absence of the four outer toes and partial absorption of the metatarsal bones. Sensation in this leg is diminished.

Case 7.—J. H. T., maculo-anæsthetic type. Born, 1851, in Guam. Reclused, September 13, 1909.

HISTORY: In 1899, this patient began to notice weakness of the right hand, together with loss of sensation. The weakness slowly progressed. He had no febrile attacks and does not remember any other peculiarities of onset. In 1900, white spots appeared on the fingers of his right hand. In the same year he began to notice numbness in both feet. This progressed in the right foot until sensation was lost. In 1905, a perforating ulcer appeared on the sole of the right foot at



CASE 6



CASE 9.

the base of the great toe. At the same time necrosis of one of the bones of the little toe occurred, requiring amputation of the toe.

EXAMINATION: The Wassermann reaction is positive. Lepra bacilli were found in the blood. The scalp, eyes, nose, mouth, tongue, and adjacent structures are normal. No nodules or infiltration are present. The skin of the chest and abdomen shows small, sharply defined, nonanæsthetic macules. Small macules also exist on the flexor surface of the right forearm and to a less degree on the extensor surface. On the back of the right forefinger there is a sharply defined unpigmented macule. Similar macules exist on the right middle, ring, and little fingers. These macules are not anæsthetic except those within the general area of anæsthesia. The lumbar region shows a large nonanæsthetic macule extending across the back and downward from the ribs to the sacrum. It is lighter in the center than the normal skin, while its periphery is superpigmented. On each buttock is a similar macule. There is slight thinning of the eyebrows. There is loss of pain, temperature, and tactile sense in the right upper extremity below the insertion of the deltoid muscle. The right leg shows loss of sensation below the junction of the upper and middle thirds on the outside, and from the junction of the middle and lower thirds internally. Sensation in the left upper and lower extremities is normal. There are no areas of hyperæsthesia. There is a perforating ulcer on the sole of the right foot at the base of the great toe. During examination, profuse perspiration was noticed over the body with the exception of the right upper extremity below the insertion of the deltoid. The right ulnar nerve is enlarged and can be felt from a little above the internal condyle to a point half way down the forearm. There is atrophy and consequent weakness of the muscles of the right forearm and hand which appears flattened, the fingers being semifixed in extension. The inguinal and axillary glands are enlarged, yet moderately soft. The testicles are small and not tender on pressure. The liver and spleen are normal in size.

Case 8.—J. T. T., maculo-anæsthetic type. Born, 1865, in Guam. Reclused, 1903.

HISTORY: The disease began in 1877 with a sensation of tingling and burning in the right heel. This sensation gradually spread over the entire foot, and then the left foot became similarly affected. A year or so later shooting pains occurred down the outside of the legs. In 1881 he began to have tingling in both hands and about this time he noticed loss of sensation in his feet, and, a few years later in his hands. About 1897, he contracted epidemic anterior poliomyelitis which caused paralysis of the lower extremities from which he somewhat recovered. No friends or relatives as far as he knows were lepers.

EXAMINATION: The Wassermann reaction is positive. *Lepra bacilli*, after repeated search, were found in the blood. The scalp, eyes, nose, mouth, tongue, and adjacent structures are normal. There are no nodules, infiltrations, or macules, and no loss of hair. There is loss of sensation in the skin over the right elbow, and on the ulnar side of the right forearm from a point midway between the elbow and the wrist joint, and, on the radial side, from the junction of the lower and middle thirds. The back of the hand, the palm, and the fingers are anæsthetic with the exception of the tip of the thumb. The skin over the left elbow is anæsthetic. In the left hand sensation is lost below a point 2 inches above the wrist joint anteriorly and posteriorly. Both legs are anæsthetic below the knee joint with the exception of a small spot just below the attachment of the inner hamstring muscles. There are no areas of hyperæsthesia. There is an ulceration on the inner border of the left foot due to pressure. Perspiration is normal. Both ulnar and both peroneal nerves are enlarged. The muscles of the lower extremities are weak (probably due to anterior poliomyelitis). There is marked atrophy and weakness of the muscles of the right forearm, the base of the thumb and hand. The patellar reflexes are absent. There is a marked fibrillary tremor of the face. Both hands and both feet show bone absorption and tendinous contracture. The femoral and inguinal glands are enlarged. The testicles, liver, and spleen are normal in size.

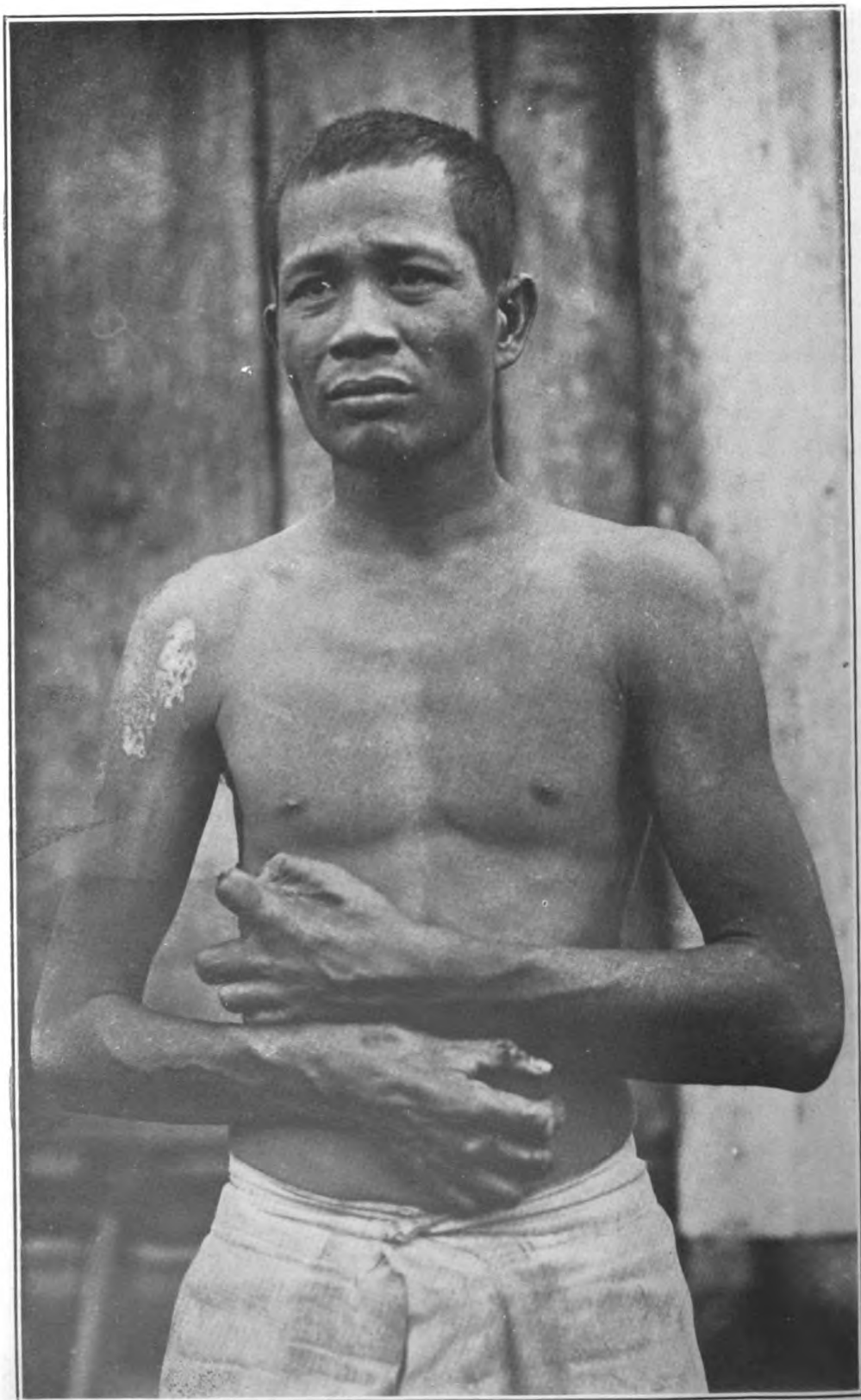
Case 9.—L. C. (father of case 18), maculo-anæsthetic type. Born, 1835, in the Philippine Islands. Reclused, 1902.

HISTORY: The disease began in 1892 with a feeling of coldness in both feet. Some months after he began to notice numbness and tingling in both feet. Two years later his hands became similarly affected and he began to have shooting pains in both legs and a little later in the arms. These pains were very severe, lasting about five years. On their disappearance paralysis of the leg muscles slowly developed. He does not remember having had febrile attacks prior to the onset of the disease. Before his reclusion, he lived with his son, who is a leper of the mixed type but in whom the disease began with nodule formation about 1890, thus making it possible for the father to have contracted the disease from the son.

EXAMINATION: The Wassermann reaction is negative. *Lepra bacilli* after repeated examinations were found in the blood. The scalp, nose, mouth, tongue, and adjacent structures are normal. Both eyes present ectropion of both lids, marked arcus senilis with slight infiltration of the center of the cornea. The skin, which is dry and scaly, shows neither nodules, infiltration, nor loss of hair. There is loss of tactile, pain, and temperature sense over the right scapula. Sensation is diminished along the ulnar border of the right forearm and is absent over the hand below the wrist joint. Sensation is



CASE 10.



CASE 11.

diminished on the lower half of the thighs and the inner side of the legs. It is absent from the remaining portion of the legs and from the feet. There are no areas of hyperæsthesia. The ulnar and peroneal nerves are slightly enlarged. There is marked atrophy and paralysis of the muscles of the anterior and outer sides of the legs with consequent foot-drop and slight inner rotation. Both hands show marked atrophy of the muscles with contracture of all fingers. The patellar reflex is absent. The inguinal glands are enlarged. The liver and spleen are normal in size.

Case 10.—L. R. R., maculo-anæsthetic type. Born, 1858, in Guam. Reclused, 1902.

HISTORY: The disease began in 1891, with tingling and numbness of both feet followed some months later by the same condition in both hands. About the same time light-colored areas appeared on the back of the arms, forearms and hands, and on his back. These spots were anæsthetic. After a year or more, the patient noticed a loss of feeling in all extremities which has steadily progressed. He has had neither pain in his limbs nor febrile attacks. About four years after the onset, he "stubbed his toes against a rock." Ulceration of the ends of the toes followed and "the bones dropped out," the ulceration then healing.

EXAMINATION: The Wassermann reaction is negative. Lepa bacilli were found in the blood. The scalp is normal. There is ectropion of the lids of both eyes. The nose shows ulceration of the septum. The mouth, tongue, and adjacent structures are normal. The skin is dry and scaly. No macules, nodules, nor infiltration are perceptible. There is slight thinning of the eyebrows. There is loss of tactile, pain and temperature sense over the chest except in a small area over the upper part of the sternum. The shoulders and both upper extremities, the back below the level of the spine of the scapula, except in the interscapular space, the buttocks and the lower extremities, except for a small area in the left Scarpa's triangle, also are anæsthetic. No areas of hyperæsthesia exist. Both hands show ulcerations due to burns. Perspiration occurs only on the head, neck, over the upper part of the sternum, in the axillæ and over the abdomen. Palpable nerves are not greatly enlarged. There is marked atrophy and weakness of the muscles of both forearms, hands, and legs. There is paralysis of the left frontalis muscle. Reflexes are absent. The fingers and the right foot show extreme bone absorption.

Case 11.—J. T., maculo-anæsthetic type. Born, 1873, in Guam. Reclused, September 13, 1909.

HISTORY: In 1904, the patient first noticed a sensation "as if small insects were crawling around on top of the right foot." This was followed by "tingling" in all of the toes of the right foot. This sensa-

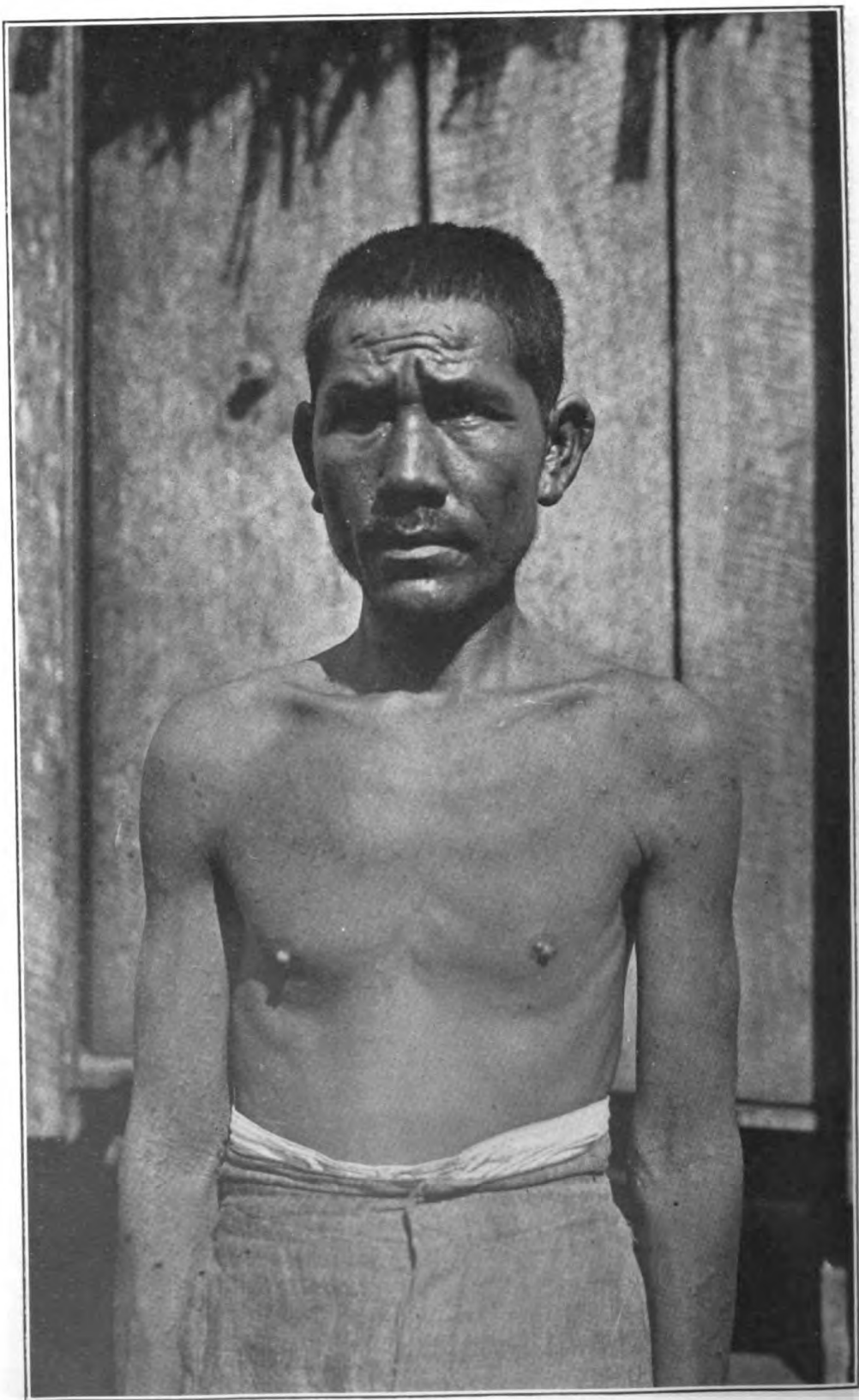
tion of tingling gradually ascended the leg until it reached a point just below the knee. In a lesser degree it persists. About a year later he began to have sharp momentary shooting pains deep in the right leg which, to a certain extent, still occur. About the same time tingling began in the left hand and gradually extended from the fingers to the elbow. In 1908, he began to notice a loss of sensation in the right foot and leg. In 1910, the sensation of tingling appeared in the left foot and still exists. It is limited to below the ankle joint. He has had no pain in the left leg, but now notices a diminution of sensation in it. In the same year the right forearm and hand became affected with at first tingling and later anæsthesia. He has had no febrile attacks.

EXAMINATION: The Wassermann reaction is positive. *Lepra bacilli* were found in the blood. The scalp, nose, mouth, tongue, and adjacent structures are normal. Both eyes show a slight pterygium on the nasal side. No nodules or leprous infiltration are present. The skin on the right shoulder, behind, shows an unpigmented, non-anæsthetic macule having sharply defined borders. The lumbar region presents a large, anæsthetic macule extending from the thorax to the sacrum and to the posterior axillary line on each side. Its color is lighter than the normal skin, but its borders, which are sharply defined, are slightly superpigmented and hyperæsthetic. The lower half of the left buttock and the external aspect of the left thigh present an anæsthetic macule with poorly defined borders which is covered with fine, dry scales. There is no loss of hair. In addition to the anæsthetic macules, the right forearm and hand show absence of tactile, pain, and temperature sense from a point 2 inches below the elbow joint. The left forearm and hand show the same condition from the elbow downward. There is loss of sensation over the outside, the dorsum, and the four outer toes of the left foot. The right leg is anæsthetic below the junction of the upper and middle thirds on the inside and the middle and lower thirds on the external surface. Numerous ulcers due to burns exist on the fingers. Perspiration is absent from the anæsthetic macules. Both ulnar nerves are enlarged. There are no paralyses, but there is atrophy of the muscles of both forearms and hands. The patellar reflexes are exaggerated. The hands show absorption of some of the phalanges and contracture of the fingers. The testicles are smaller than normal and are not painful on pressure. The liver and spleen are normal in size.

Case 12.—V. Q. O., maculo-anæsthetic type. Born 1868(?), in Guam. Reclused, April 18, 1906. No reliable history is obtainable. The Wassermann reaction is positive. *Lepra bacilli* were found in the blood. The scalp, eyes, mouth, tongue, and adjacent structures are normal. In the nose is an ulceration of the septum. There are no nodules or infiltration. On the right cheek is a light-colored, non-



CASE 12.



CASE 13.

anæsthetic macule, the periphery of which is slightly raised and hyperpigmented. It extends down to and joins with a similar macule on the right side of the neck. Unpigmented, sharply defined, nonanæsthetic macules occur on the flexor surfaces of the legs. There is no loss of hair. There is anæsthesia over the outer border of both feet, the little toes, and the adjacent half of the fourth toes. There is diminished sensation on the ulnar side of both forearm and hands. No areas of hyperæsthesia were found. The right foot shows a perforating ulcer at the base of the little toe. Perspiration is normal. No enlarged nerves were found. No paralyses exist. The reflexes are normal. The fingers show bone absorption and contracture. No enlarged glands were felt. The liver and spleen are normal in size.

Case 13.—J. B. D., mixed type. Born, 1868, in Guam. Reclused, March 3, 1909.

HISTORY: In 1906, he was told that he had large red spots on the back and buttocks. A few months later he noticed a sensation "as if ants were crawling over" him. This sensation was general and was followed by tingling in the toes of both feet, and later by sharp, shooting pains in both legs. In 1907, he first noticed loss of sensation in his hands and feet. In 1908, his face and ears became infiltrated and nodular.

EXAMINATION: The Wassermann reaction is positive. *Lepra* bacilli were found in large numbers in the nasal secretion and in scrapings from the nodules. The scalp, mouth, tongue, and adjacent structures are normal. There is a pterygium on the nasal side of both eyes and an ulceration of the nasal septum. There is nodular infiltration of the forehead, superciliary region, nose, cheeks, chin, and ears. The extensor surface of the right arm also is slightly involved and several small nodules are found on the back. There is marked thinning of the eyebrows. The back of the right elbow and spots along the ulnar border of the right forearm, the front of the left knee, the dorsum, sides and toes of the left foot, the outer and anterior surfaces of the right thigh (lower half), the dorsum, sides and toes of the right foot, and the outer side of the right ankle are anæsthetic. There are no ulcerations except that of the nasal septum. Perspiration is absent from the back of the right arm and the front of both knees. Both ulnar and peroneal nerves are enlarged. There are no paralyses. The patellar reflexes are diminished. The inguinal glands are swollen. The liver and spleen are normal in size.

Case 14.—J. C. Q., mixed type. Born, 1887, in Guam. Reclused, November 19, 1909.

HISTORY: In 1904, the patient first noticed tingling sensations in the three outer toes of both feet. Some time after this he noticed diminished sensation in these toes and along the outer border of the

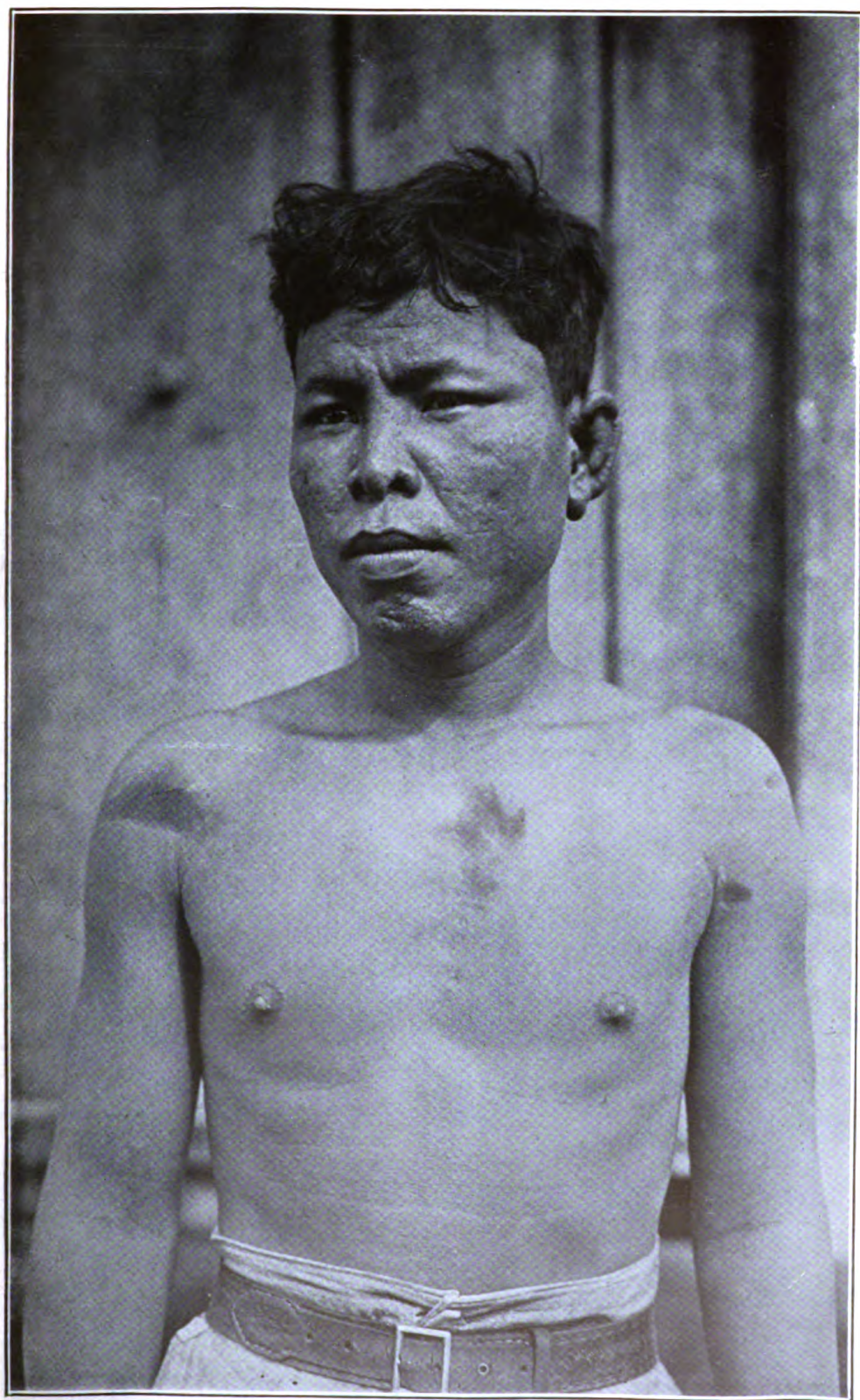
feet. In 1907, during a slight febrile attack, he noticed a red spot on his left arm. When the temperature subsided this spot disappeared, but left an area lighter than the surrounding skin. One year later, during another febrile attack, a red induration appeared on the forehead. This lesion remained. His ears next became nodular, and later the malar eminences and the chin. None of his relatives are lepers and, as far as he knows, none of his former associates were affected with the disease.

EXAMINATION: The Wassermann reaction is positive. *Lepra* bacilli were found in the blood and in smears from the nodules. The scalp, eyes, mouth, tongue, and adjacent structures are normal. There is ulceration of the nasal septum. Leprous nodules are present on the forehead, cheeks, nose, ears, chin, elbows, and knees. The skin of both legs is dry and covered with shiny, white scales, probably due to trophic disturbances. The toes are enlarged, red and glossy. A slightly pigmented nonanesthetic macule is seen on the anterior aspect of the left arm. There is thinning of the outer half of the eyebrows. Small, irregularly situated areas of anesthesia exist on both legs. The toes show diminished sensation. There are no areas of hyperesthesia. Ulcers occur on the inner side of the left ankle and on the plantar surface of the great toe. The right great toe is similarly affected. Perspiration is absent over the legs. Both ulnar and both peroneal nerves are enlarged. There are no paralyses. Reflexes are normal. The right foot shows absorption of the terminal phalanx of the middle toe. The epitrochlear, inguinal and femoral glands are enlarged. The testicles are smaller than normal and are not painful on pressure. The liver and spleen are normal in size.

Case 15.—J. Q. T., mixed type. Born, 1876, in Guam. Reclused, 1902.

HISTORY: In 1896, red, indurated spots slowly appeared on her face without any febrile attacks. This induration of the skin of the face remained about 10 years. In 1906, she began to have tingling sensations in both feet, and later sharp shooting pains in her legs. Some months after this she noticed loss of sensation in both feet and at the same time rapid diminution of sight in the right eye. With the onset of these symptoms the infiltration and nodulation of the face became less marked. In 1908, tingling and later shooting pains occurred in both arms and hands, followed by loss of sensation. The tingling sensations and shooting pains still occur at times in both upper and lower extremities, and if the sides of the legs are compressed a severe pain results, showing that an active neuritis exists. Menstruation is normal.

EXAMINATION: The Wassermann reaction is positive. *Lepra* bacilli were found in nose lesions. The scalp, mouth, tongue, and adjacent structures are normal. Sight is gone in the right eye. The



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CASE 15.

eyeball is shrunken and soft. The cornea is infiltrated and partially absorbed. There is a marked pannus extending over the cornea. In the left eye, the cornea is infiltrated in spots. There is destruction of the nasal septum, with sinking of the nose. There is an old nodular infiltration of the superciliary region, cheeks, nose, and chin. The ears show small subdermal nodules. Both elbows and both knees are nodular. The eyebrows and eyelashes are absent. Anæsthesia exists on the ulnar side of the left forearm and hand, the little finger, and one-half of the adjacent finger. The left leg is anæsthetic below the knee except for a small area on the upper part of the posterior surface. The right thigh is anæsthetic on the lower half of the anterior surface, also the right leg except on the inner side, where sensation is diminished but not absent. There are no areas of hyperæsthesia. There is paralysis of the frontalis muscle. Leprous ulceration occurs on both elbows. There is trophic ulceration of the dorsum of the left foot and of the plantar surface of the right great toe. Ulcerations due to burns occur on the fingers. Both ulnar nerves are enlarged. Reflexes are diminished. The epitrochlear and femoral glands are enlarged. The liver and spleen are normal in size.

Case 16.—V. C. N., mixed type. Born, 1885, in Guam. Reclused, January 2, 1909.

HISTORY: In 1903, the patient noticed some firm, slightly raised spots on his left forearm, similar in appearance to some which later appeared on his forehead. Shortly after the development of these infiltrations, he began to have occasional sharp, shooting pains down both legs. Sensation in his feet was gradually lost. In 1905, he began to notice loss of sensation in both hands. The patient states that he had no febrile attacks until September, 1911, when an attack of leprosy fever lasting two months occurred. The temperature varied from 101° F. to 103° F. and was continuous, subsiding by lysis. Shortly after its onset the skin of his face, back, chest, abdomen, and the extensor surfaces of his arms became intensely nodulated. A number of the nodules broke down, leaving suppurating ulcerations. Between the nodulations, especially on the face and sides of the chest and abdomen, darkly pigmented areas occurred. During this attack the patient became very weak and suffered a great deal from pain in the nodules. After the temperature subsided extensive exfoliation of the superficial epithelium occurred.

EXAMINATION: The Wassermann reaction is positive. Lepa bacilli were found in the nodules in large numbers. The scalp is normal in spite of the intense leprosy infiltration and epithelial exfoliation over the rest of the body. There is ulceration of the nasal septum. The eyes, mouth, tongue, and adjacent structures are normal. Both ears, the forehead, cheeks, upper lip, chin, the back, chest, and the extensor surfaces of both arms are nodular and infil-

trated. With the exception of the scalp, the face, and a V-shaped area over the sternum, the entire skin is dry and covered with large, flaky scales of epithelium. The face, both sides of the chest, and abdomen show pigmented, nonanæsthetic macules having sharply defined borders, but uniform in color throughout. There is marked thinning of the eyebrows. Anæsthesia occurs over the ulnar side and back of the left forearm and over the entire left hand. There is loss of sensation over the ulnar side of the right forearm, the back of the hand, and the fingers. In the palm the sensation is diminished but not absent. Both feet are anaesthetic below the ankle joint, except over the sole, where sensation is diminished. There are no areas of hyperæsthesia. Besides the numerous ulcerating nodules, there are ulcerations on the fingers, due to burns. At the time of the examination perspiration occurred only on the head and neck. Both ulnar nerves are slightly enlarged. Reflexes are normal. The fingers exhibit contractures and bone absorption.

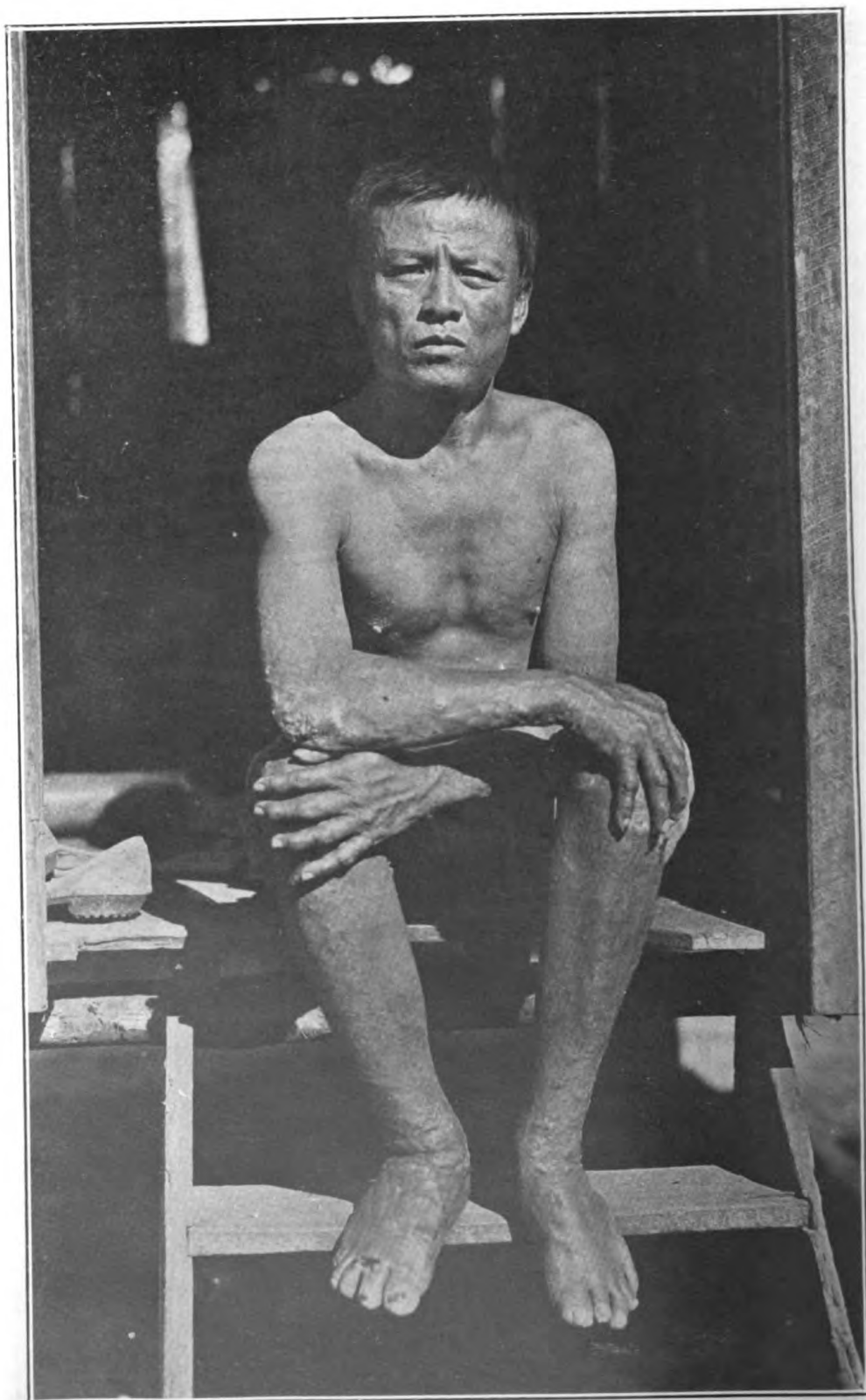
Case 17.—J. U. U., mixed type. Born, 1873, in Guam. Reclused, November 4, 1907.

HISTORY: In 1903, he fell from a tree and injured his back. For a time he could not move his lower extremities or empty his bladder. He gradually recovered the use of his limbs and was able to walk, when red, indurated areas appeared on his legs. He had no febrile disturbances. A little later the lobes of his ears began to thicken, and nodular infiltration appeared on the forehead, cheeks, and chin. A year or so later, he began to notice numbness of both feet and legs. His arms were not involved until early in 1911, when red indurations appeared in the skin, together with a sensation of tingling.

EXAMINATION: The Wassermann reaction is negative. *Lepra* bacilli were found in smears from the nose and from the nodules. The scalp, mouth, tongue, and adjacent structures are normal. A slight pterygium occurs on the nasal side of the right eye. A pannus extends over the upper fourth of both corneæ. The nose shows a perforation of the septum. There is slight and apparently old leprous induration on the forehead, especially in the superciliary region; also over the malar bones and on the chin. The ears show old nodulations. The sides of the chest, the abdomen, the back (below the angles of the scapulæ), the posterior and outer surface of both upper extremities, the buttocks, the legs and the dorsum of the feet show extreme recent leprous infiltration which is not much raised above the normal skin, but which is sharply outlined, hairless, and of a reddish-brown color. Across the shoulders and back is a large, unpigmented, nonanæsthetic macule. Tactile, pain, and temperature sensation is diminished in both hands, especially on the ulnar side, over the little finger and the adjacent half of the ring finger.



CASE 16.



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Sensation is diminished in both legs and is absent over the toes. There are no areas of hyperæsthesia. Perspiration is absent from the infiltrated areas. There is thinning of the eyebrows. The ulnar and peroneal nerves are enlarged, especially the latter. There is slight loss of strength in both forearms and paralysis of the extensor muscles of the right thigh and of both legs with consequent foot-drop. The injury to his back is probably responsible for some of this paralysis, but to what extent is difficult of determination. The patellar reflexes are absent. The epitrochlear, inguinal, and femoral glands are enlarged. The testicles, liver, and spleen are normal in size.

Case 18.—J. C. D. (son of case 9), mixed type. Born, 1880, in Guam. Recluded, 1902.

HISTORY: The disease began when 10 years of age with "red spots on the chin, cheeks, and forehead and lumps in the ears." These leprous infiltrations were followed by light-colored, anæsthetic macules on the body. The patient had no febrile attacks that are now remembered. Some few months after the onset, he noticed loss of sensation in the feet and then in the hands. Shortly after this there began rapid absorption of the bones of the fingers and toes and later "falling off" of the toes. This absorption process was completed in two years. With the onset of the anæsthesia, there was a diminution in the size of the infiltrations and nodules.

EXAMINATION: The Wassermann reaction is positive. Lepa bacilli were found in the lesions. The scalp, eyes, mouth, tongue, and adjacent structures are normal. The nose shows a perforation of the septum. There is slight old leprous infiltration over the superciliary region, on the cheeks and chin. The ears are slightly nodular. These lesions have the appearance of having undergone fibrosis. There is loss of the eyebrows, mustache, and beard. No macules are seen. Tactile, pain, and temperature sensation is absent from the skin over the right shoulder, the outer and posterior sides of the right arm and from the anterior and radial border of the forearm down to the middle, below which all superficial sensation is lost. The left shoulder and the back on the left side downward to the tenth rib and laterally to the posterior axillary line is anæsthetic. Sensation is lost on the posterior surface of the arm and forearm and on the radial side of the wrist. The entire hand is anæsthetic. Anæsthesia exists from the waist line downward except over both Scarpa's triangles. There are no areas of hyperæsthesia. Perforating ulcers occur on both feet at the base of the big toe. Perspiration is limited to the face, neck, chest in the region of the sternum, the axillæ, and the inside of both arms. In these localities the perspiration is abnormally large in amount. No enlargement of the nerves is felt. The muscles of both forearms and hands show weakness and atrophy. Reflexes are

normal. Both hands show marked bone absorption. The femoral glands are enlarged. The testicles are smaller than normal and are not tender on pressure. The liver and spleen are normal in size.

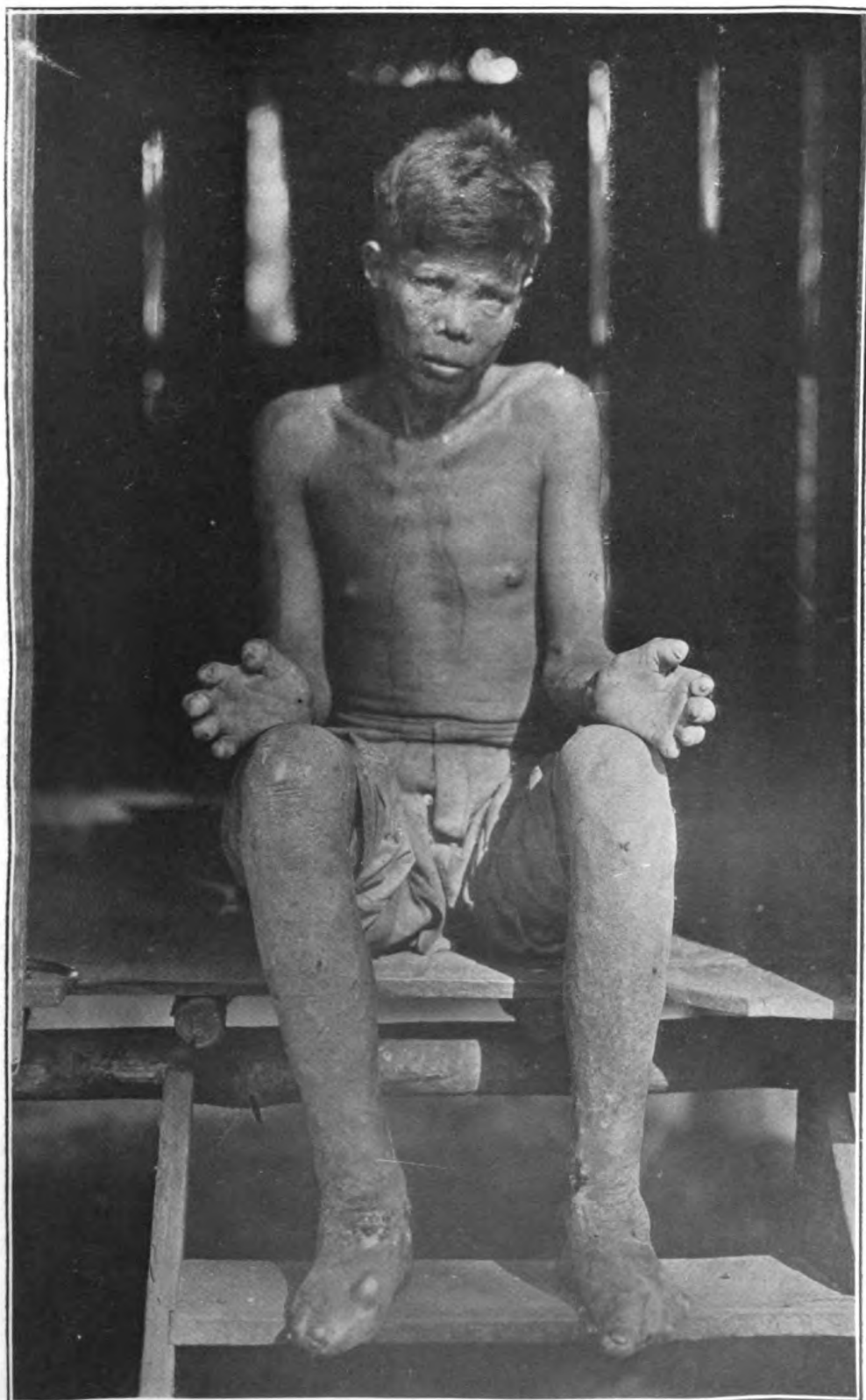
Case 19.—P. A. L., mixed type. Born, 1895, in Guam. Reclused, June 2, 1909.

HISTORY: In the summer of 1908, the patient first noticed red patches on his face, which were preceded by a burning sensation in the areas involved. He had no fever. The spots remained after their first appearance and later others came. These spots gradually became thick and firmer than the surrounding skin. The lobes of the ears next became large and thick. Early in 1910, he began to have tingling and burning sensations in both feet followed shortly by a diminution of sensation. Later both hands were similarly affected, but not to such a marked degree. He now has at times severe shooting pains in the calves of both legs.

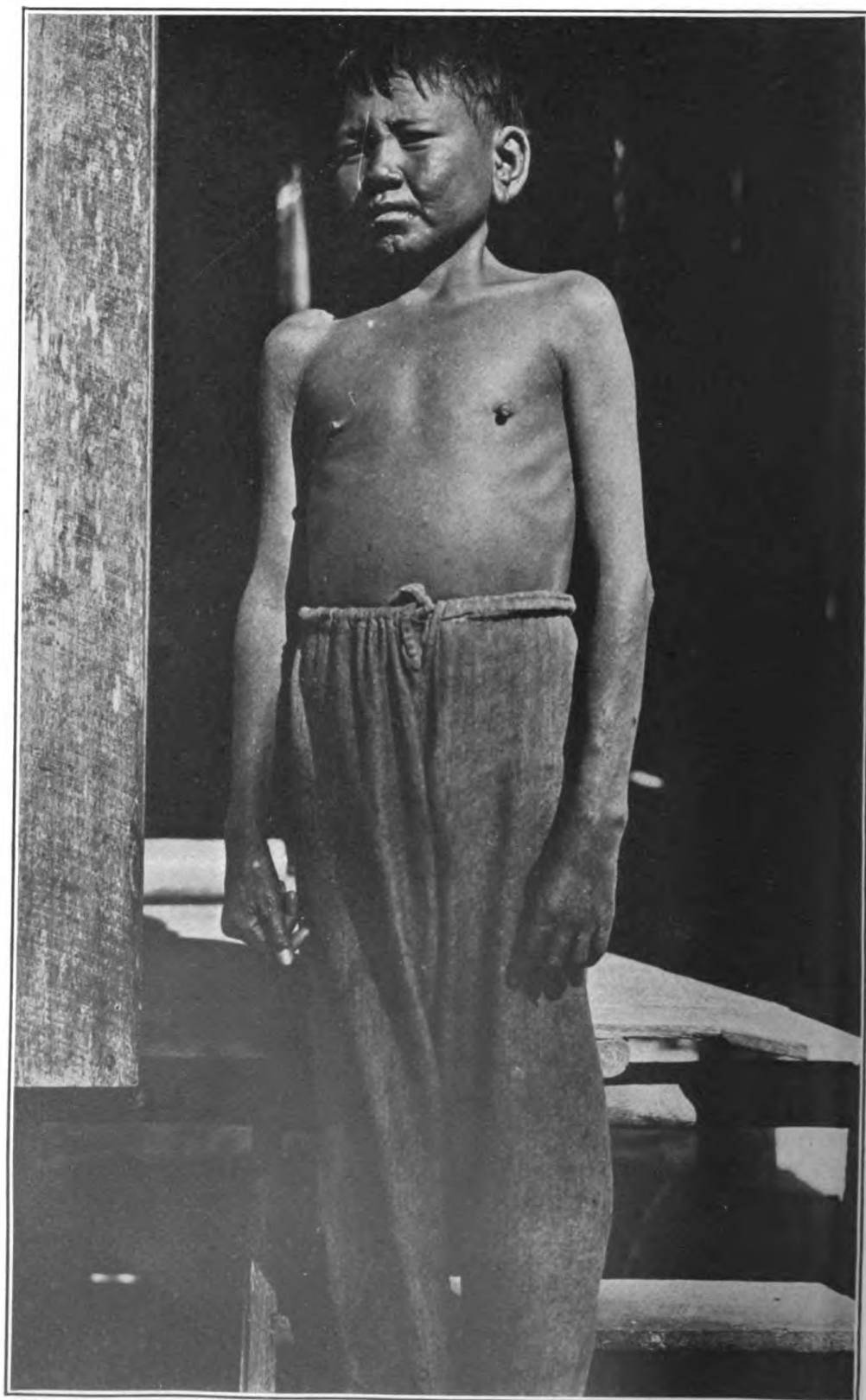
EXAMINATION: The Wassermann reaction is positive. *Lepra bacilli* were found in smears from the nose and from nodules. The scalp, eyes, mouth, tongue, and adjacent structures are normal. The nose shows a perforation of the septum. Leprous nodules exist on the forehead and superciliary region, in the lobes of both ears, on the cheeks, chin, and both elbows. There is thinning of the eyebrows. Tactile, pain, and temperature sense is diminished on the external aspect of the left leg below the junction of the upper and middle thirds, internally from the junction of the middle and lower thirds and in front and behind below a line joining these two points. The entire foot shows a more marked diminution of sensation. In the right leg sensation is diminished over the lower third and over the entire foot. There are no areas of hyperæsthesia. No ulcerations occur. Perspiration is normal. Reflexes are normal. Both nipples are abnormally large and bulbous. All of the lymphatic glands are enlarged yet moderately soft. The testicles are normal in size. Both liver and spleen are enlarged and palpable.

Case 20.—T. M. B., mixed type. Born, 1871, in Guam. Reclused, 1902.

HISTORY: The disease began when 10 years of age with light-colored, nonanæsthetic spots on the face. Later red, firm, indurated spots appeared on the face, arms, body, and legs. The light-colored macules gradually disappeared, some of them being covered by the indurations which spread until her body was markedly involved. Many years after the onset of the disease she began to notice loss of sensation in portions of both feet and a little later in parts of both hands. At the same time she had tingling sensations in these members and often severe darting pains especially on the outer side of the legs. Menstruation began much later than in other Chamorro girls, and has always been scanty and irregular. She often has had



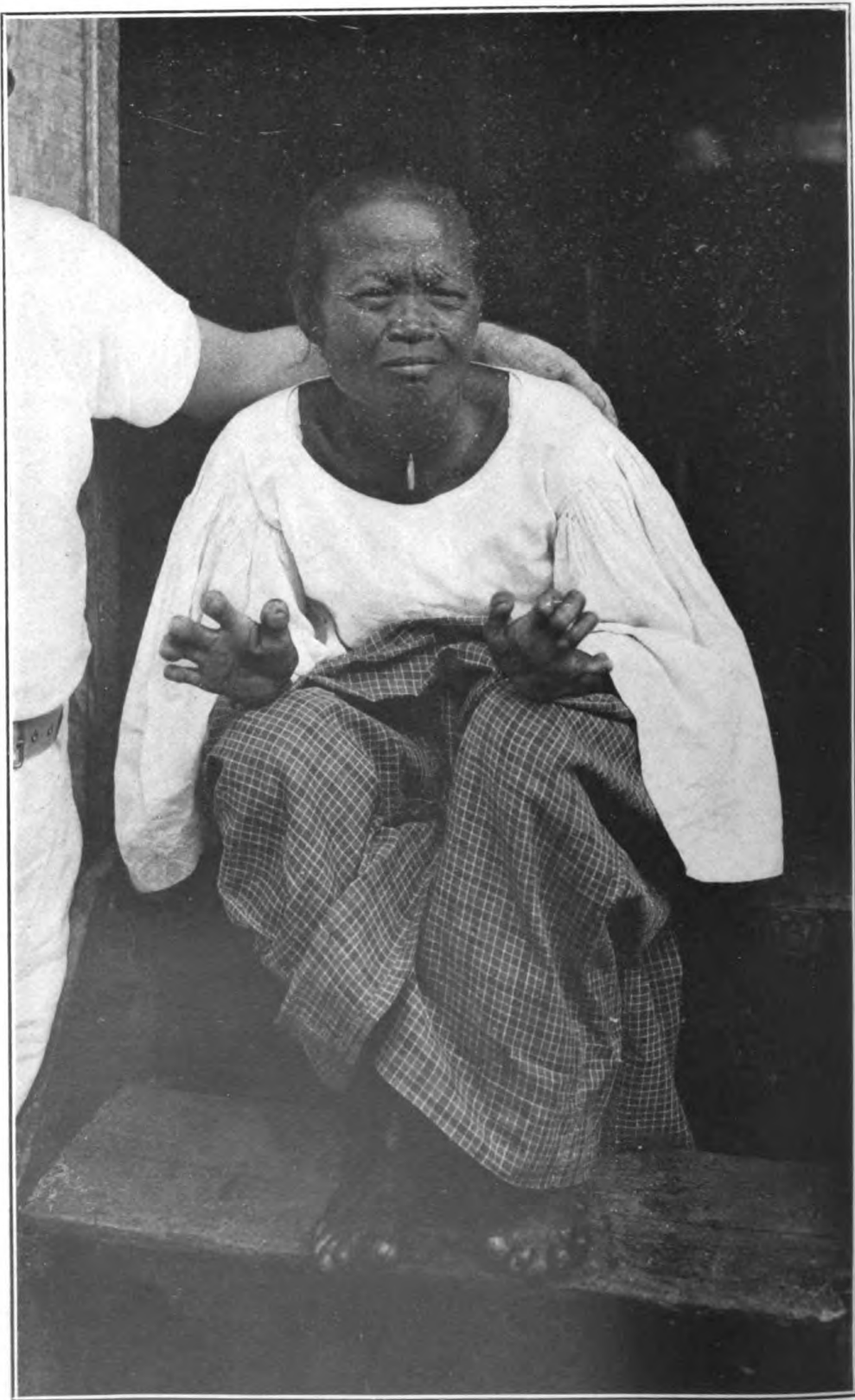
CASE 18



CASE 19



CASE 20.



CASE 21.

amenstrual intervals of five or six months' duration. There has been loss of vocal power (speaks in a whisper) since 1903.

EXAMINATION: The Wassermann reaction is positive. *Lepra bacilli* were found in open lesions. The scalp, eyes, mouth, and tongue are normal. The larynx shows leprous infiltration. The nose shows lepromata in both nares with perforation of the septum. The forehead, ears, cheeks, and chin show marked nodulation. Both arms, chest, back, and both legs show marked geographic, clearly outlined, leprous infiltration, which is somewhat anæsthetic and does not perspire. Intermingled with this infiltration are pigmented areas which are not anæsthetic. Both nipples are enlarged and bulbous. There is absence of the outer half of both eyebrows. A portion of the right cheek is anæsthetic. The back and inner side of the right arm, the ulnar side of the right forearm and hand, the little finger and the adjacent half of the ring finger is anæsthetic. The left upper extremity is anæsthetic in spots along the ulnar side of the forearm and hand. The right leg and foot are anæsthetic on the outer side. The outer border of the left foot is anæsthetic. There are no areas of hyperæsthesia. Enlargement of nerves can not be determined because of the infiltration existing in the skin. There is weakness and slight atrophy of the muscles of both forearms. Reflexes are normal. The fingers show an extreme amount of bone absorption. The toes are swollen and glossy in appearance. The femoral glands are enlarged. The liver and spleen are enlarged and palpable.

Case 21.—V. de la C., mixed type. Born, 1863, in Guam. Recluded, 1903.

HISTORY: About 1898, the patient began to have tingling sensations in both hands and in both feet. A little later she noticed beginning deformity of the fingers and toes (swelling and contracture), and then darting pains in her arms and legs. These pains were very severe and lasted, at intervals, about one year. After the disappearance of these pains she noticed that sparks from a fire falling on her fingers caused no pain and that the sense of touch was diminished. Menstruation has always been normal.

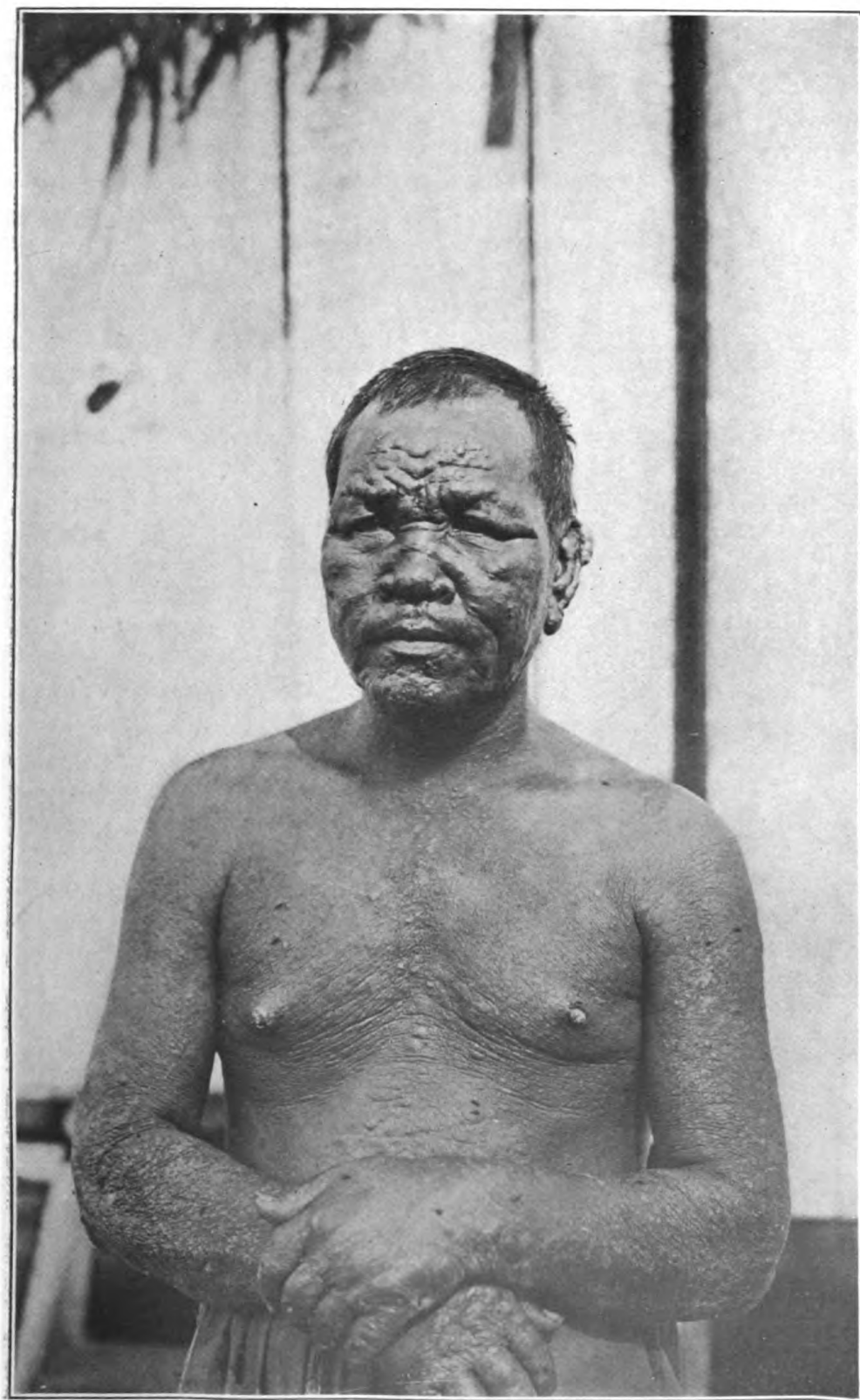
EXAMINATION: The Wassermann reaction is positive. *Lepra bacilli* were obtained from the nose. The scalp, mouth, tongue, and adjacent structures are normal. Each eye shows a pterygium on the nasal side. The nasal septum is perforated. There are no nodules or infiltrations discernible in the skin except an old fibrous induration in the superciliary region. Several unpigmented areas occur on the dorsum of each foot in which sensation is diminished but not absent. There is marked thinning of the eyebrows. Areas of anæsthesia exist on the ulnar side of the left little finger and on the outer border of both feet. There are no areas of hyperæsthesia. Ulcerations due to burns occur on the hands and fingers. Perspiration is normal.

The ulnar nerves are slightly enlarged and sensitive. Reflexes are slightly exaggerated. The femoral and inguinal glands are enlarged. Both hands and feet show bone absorption. The feet show swelling and redness of the toes. The liver and spleen are normal in size.

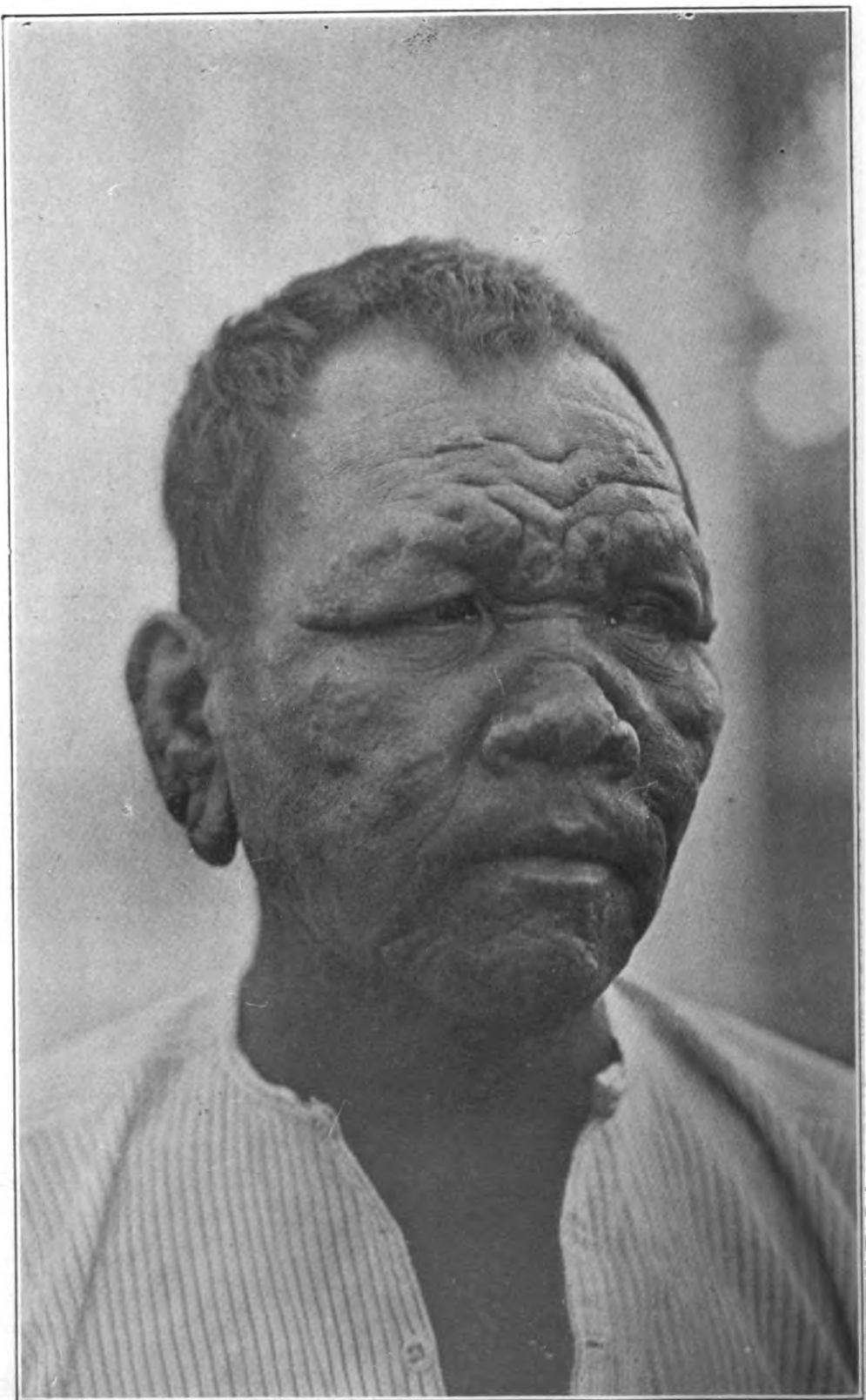
Case 22.—V. A. C., mixed type. Born, 1869, in Guam. Reclused, 1902.

HISTORY: In 1898, some light-colored spots appeared on the anterior surface of the right wrist and a little later on the chest. These remained about a year and then gradually disappeared. About the same time he was troubled with a sensation of tingling and burning in his right foot. Shortly after the disappearance of the light-colored macules relatives told him that he had red spots on his face, and he noticed small lumps in both ear lobes. These leprous infiltrations persisted, grew larger, and became thick and firm. His legs also became swollen and his feet enlarged. In 1902, sensation began to diminish in the left foot and during 1909, in the left hand. The right hand and foot became anæsthetic one year later. He remembers having had one febrile attack of two weeks duration, during which time the existing leprous lesions became enlarged and tender and new ones formed. He has never had any neuralgia.

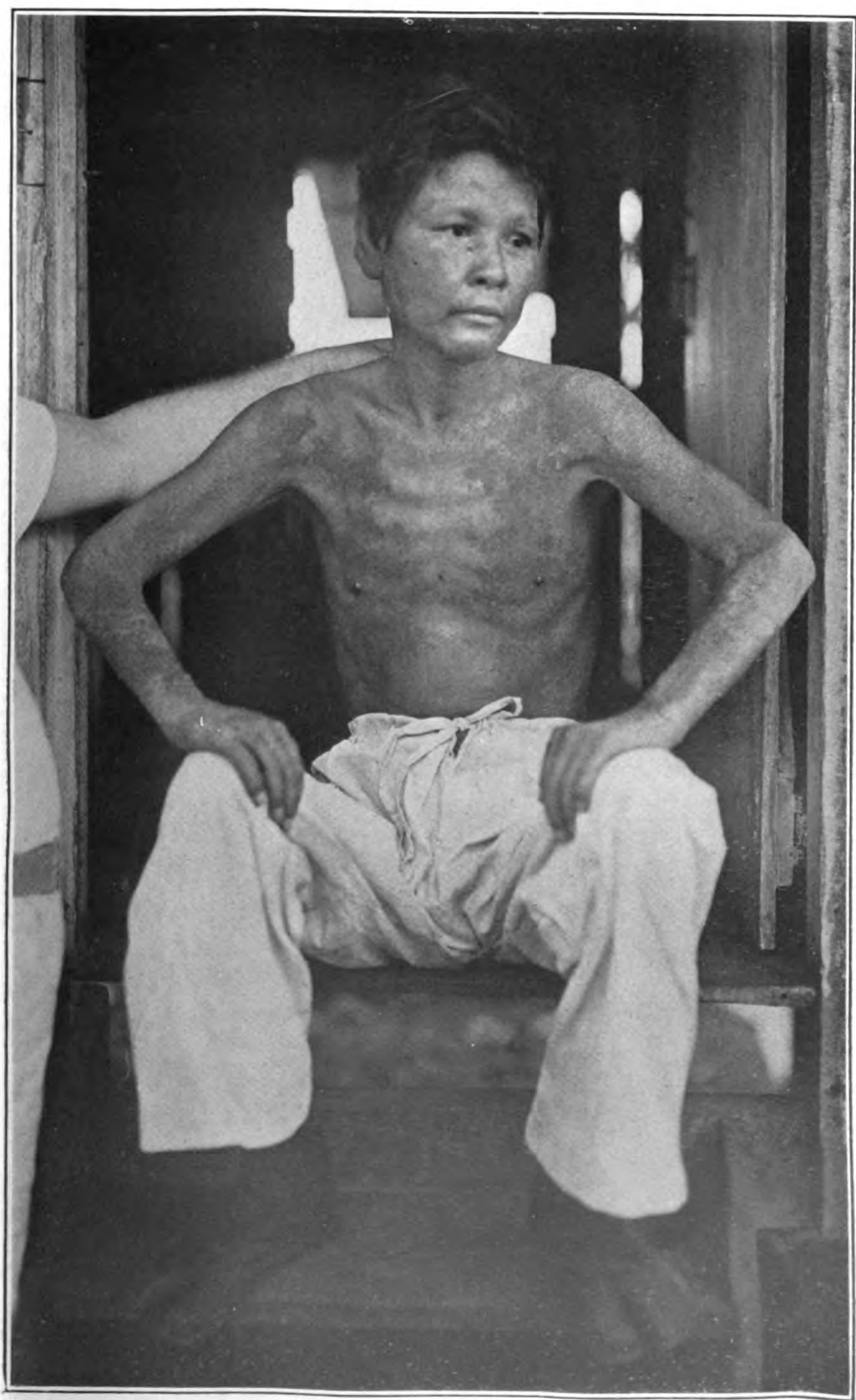
EXAMINATION: The Wassermann reaction is positive. *Lepra bacilli* were found in the lesions. The scalp, mouth, tongue, and adjacent structures are normal. A pterygium growing over the cornea occurs on the nasal side of the right eye. There is leprous ulceration of the nasal septum and of the floor of the left nostril. There are large tubercles on the forehead and superciliary region. The skin of the upper eyelids is infiltrated. Tubercles occur on the nose, both cheeks, and chin. The ears are markedly lobulated. The entire body, the upper extremities, and thighs show numerous small nodules. Some of the nodules show ulcerations, while others are covered with fine, dry, white scales. The nodules on the face are oily in appearance. The skin of the scrotum is markedly indurated. There is marked thinning of the eyebrows. There is loss of tactile, pain, and temperature sense in the left hand. Tactile sensation is diminished in the right hand, but pain and temperature sense are unaffected. In the right leg anæsthesia occurs below a point midway between the knee and ankle externally, below the ankle internally, and in front and behind below a line joining these two points. Sensation is absent in the left foot. There are no areas of hyperæsthesia. Besides the ulcerated tubercles there are ulcerations on the back of the fingers of the left hand due to injury. A perforating ulcer exists on the sole of the left foot at the base of the great toe. There is marked increase of perspiration on the face. No enlargement of the nerves can be found. There are no paralyses. The reflexes are normal. Both legs are swollen as with a tense oedema (urine and



CASE 22.



CASE 22



CASE 23.



CASE 24.

heart normal). All the toes are greatly enlarged, but show no bone absorption. The femoral, epitrochlear, and axillary glands are greatly enlarged, but moderately soft. The right testicle is slightly enlarged and not painful on pressure. The right epididymis shows several smooth nodulations. The liver and spleen are normal in size.

Case 23.—V. P. A., mixed type. Born, 1871, in Guam. Reclused, 1909.

HISTORY: The disease began in 1905, when the patient noticed red, indurated spots over both malar bones. He had no fever. Later the red indurations appeared on the forehead and above the eyes. A portion of the eyebrows "dropped out." Three years later he began to have sensations "as if insects were crawling over his hands and feet." This was followed by diminution of sensation in these members. No friends or relatives are lepers.

EXAMINATION: The Wassermann reaction is weakly positive. *Lepra bacilli* were found in the nodules. The scalp, eyes, mouth, tongue, and adjacent structures are normal. The nose shows an ulceration of the septum. There is slight nodular infiltration of the forehead. Nodules, some of which are subdermal, occur on both cheeks and in the lobes of the ears. On the outer side of both arms and on the sides of the thorax are pigmented macules which do not sweat. There is loss of the outer half of the eyebrows with marked thinning of the remainder. Both upper extremities show a loss of tactile, pain and temperature sense along the ulnar side of the forearm from a point midway between the elbow and the wrist, on the ulnar side of the wrist and hand, and over the little finger and the adjacent half of the ring finger. The external aspect of the left leg and the entire left foot are anæsthetic. The anterior surface of the right leg and the entire right foot are anæsthetic. There are no areas of hyperæsthesia. No ulcerations occur. Both ulnar and both peroneal nerves are enlarged. There are no paralyses. The reflexes are normal. The femoral glands are enlarged. The testicles, liver, and spleen are normal.

Case 24.—D. T. D., mixed type. Born, 1860, in Guam. Reclused, June 14, 1909.

HISTORY: Some years ago (the exact year not remembered) the patient had two attacks of fever about four months apart. Each attack lasted about one month. After the first attack she noticed a sensation "as if ants were crawling over her body." Later she began to have sharp shooting pains down her right leg. These, together with tingling sensations in the right foot, still persist. She has never noticed any change in sensation.

EXAMINATION: The Wassermann reaction is positive. *Lepra bacilli* were found in an ulceration on the left elbow. This ulceration is crater-like and is surrounded by an area of infiltration. A

similar ulceration occurs on the outer side of the right knee and on the dorsum of the right foot. The right leg and foot are swollen as by a tense edema. The femoral glands are enlarged. No nodules, macules, or indurations occur. There is no change in sensation or perspiration. The nerves are not enlarged, but the right peroneal nerve is tender if compressed.

In conclusion, the writer desires to express his thanks to Hospital Steward Hiram Wilson Elliott, United States Navy, for the photographic work accompanying this article; to Hospital Apprentice, First Class, C. F. Whitmore, United States Navy; and to Mr. Juan Aguon for valuable assistance rendered.

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PHOTOGRAPHS OF LEPERS.

By Passed Asst. Surg., G. F. COTTLE, United States Navy.

The accompanying photographs were given me by Dr. J. T. Wayson, of Honolulu, at a time when through his courtesy I visited the Kaliki receiving station for lepers in Honolulu, of which he has charge. He has consented to their publication to the service.

A disease so rare in the United States as leprosy is to most practitioners merely of academic interest, but for the naval surgeon it has a more real bearing. In a service recruited in part from our insular possessions where leprosy exists, the naval surgeon may be confronted at any moment with the problem of diagnosis of this disease.

Books are nearly always accessible with descriptions of leprosy lesions, but written information is not complete without the visual



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.

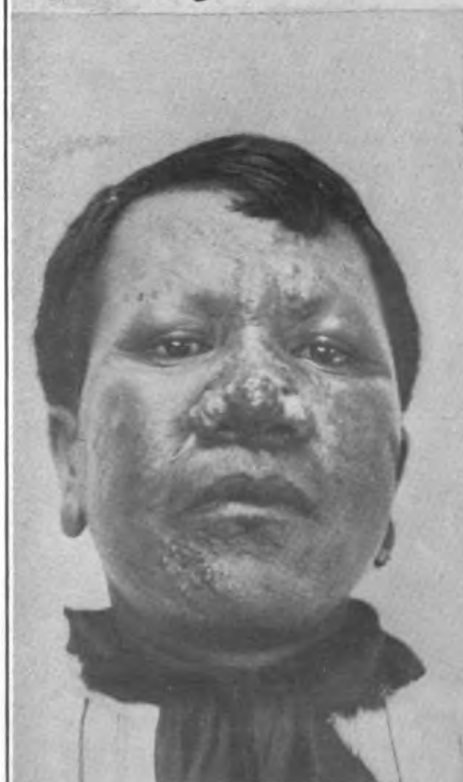


Fig. 7.



Fig. 8.

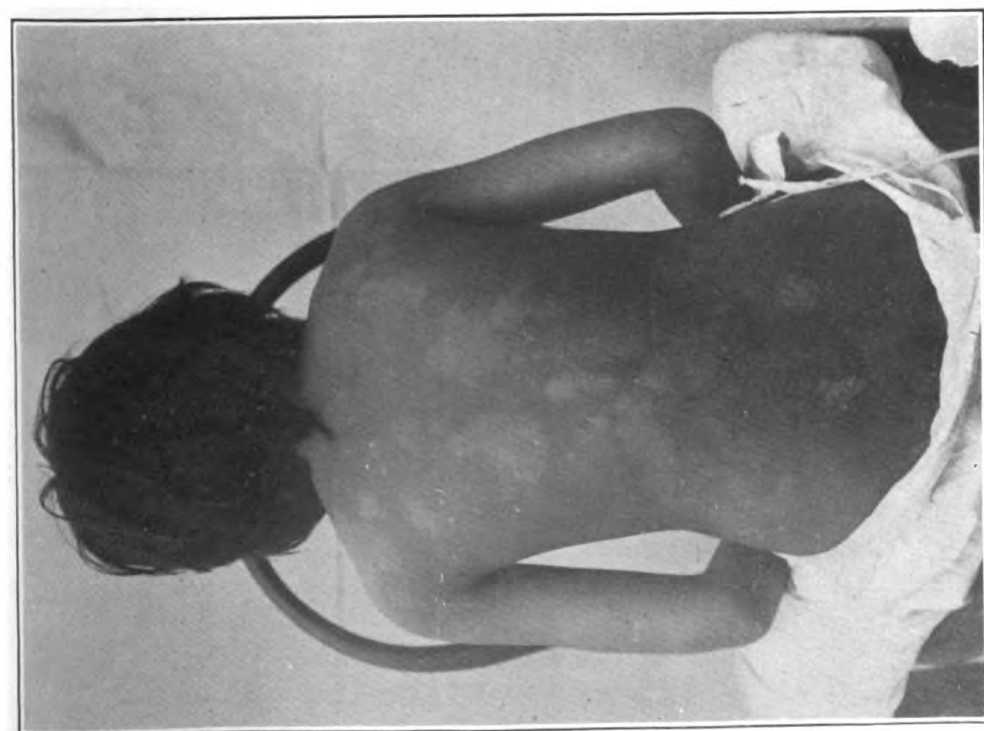


Fig. 9.

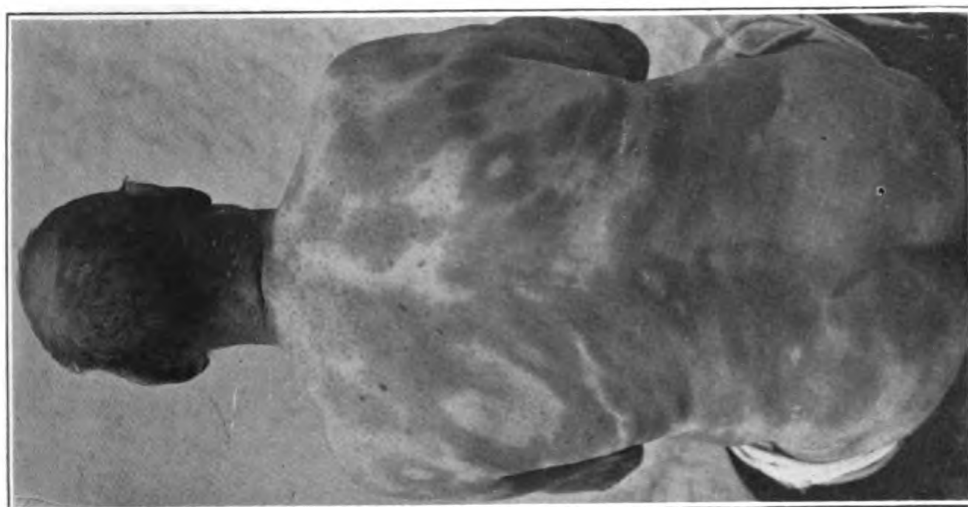


Fig. 10.



Fig. 11.

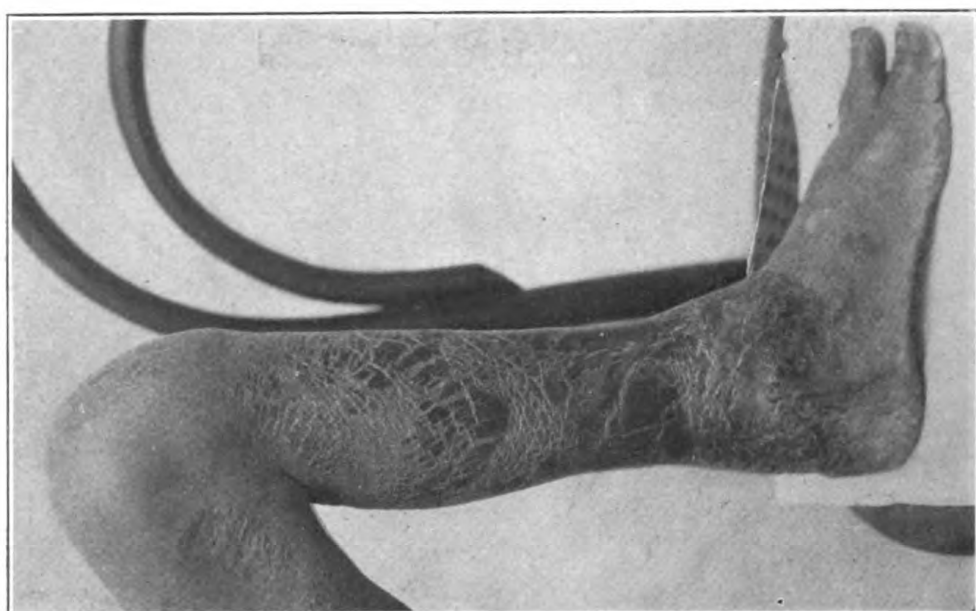


Fig. 12



Fig. 14



Fig. 13.



Fig. 15.



Fig. 16.



Fig. 17.



Fig. 18.

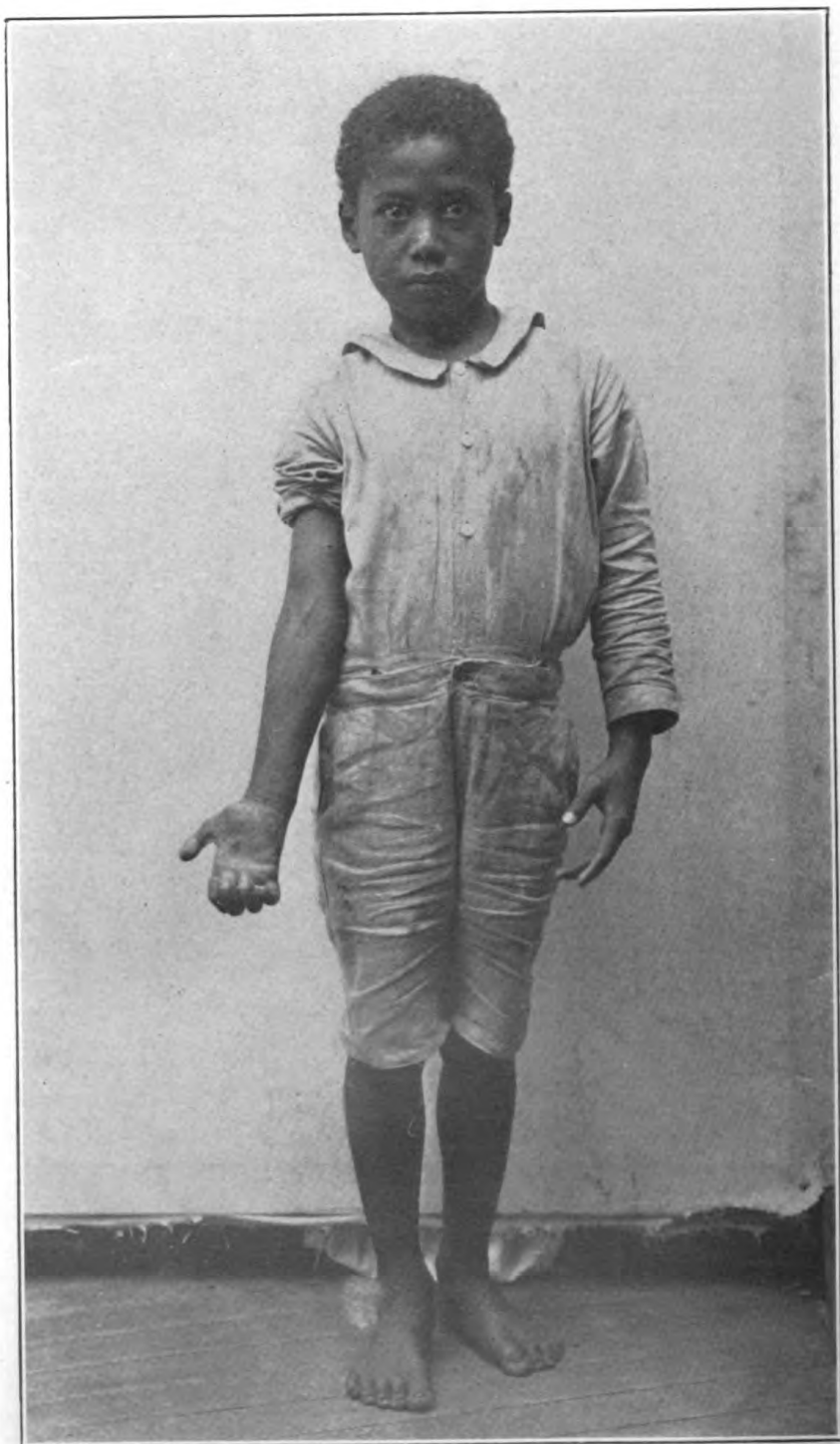


Fig. 19.



Fig. 20.



Fig. 21.



Fig. 22.

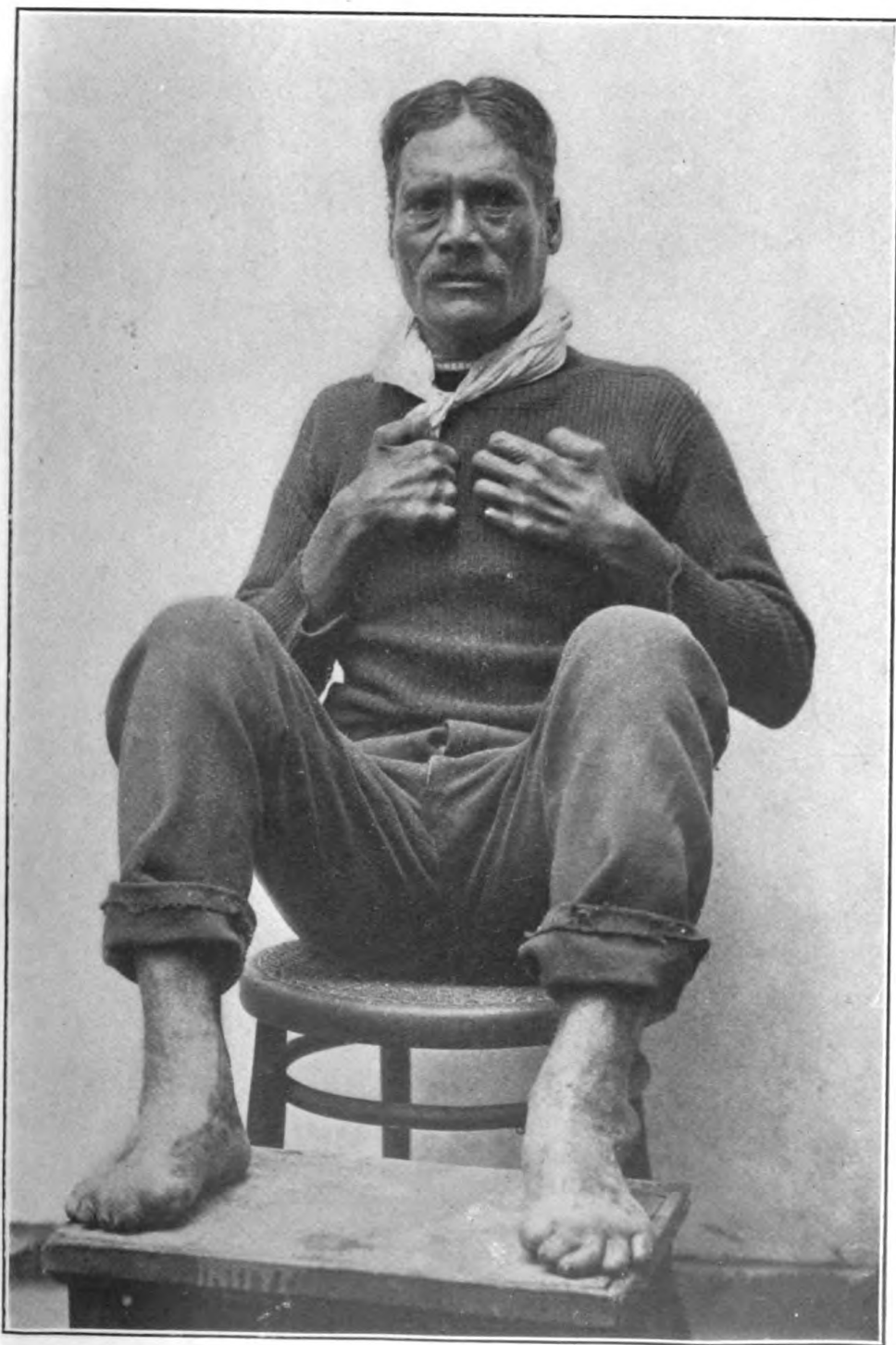


FIG. 23

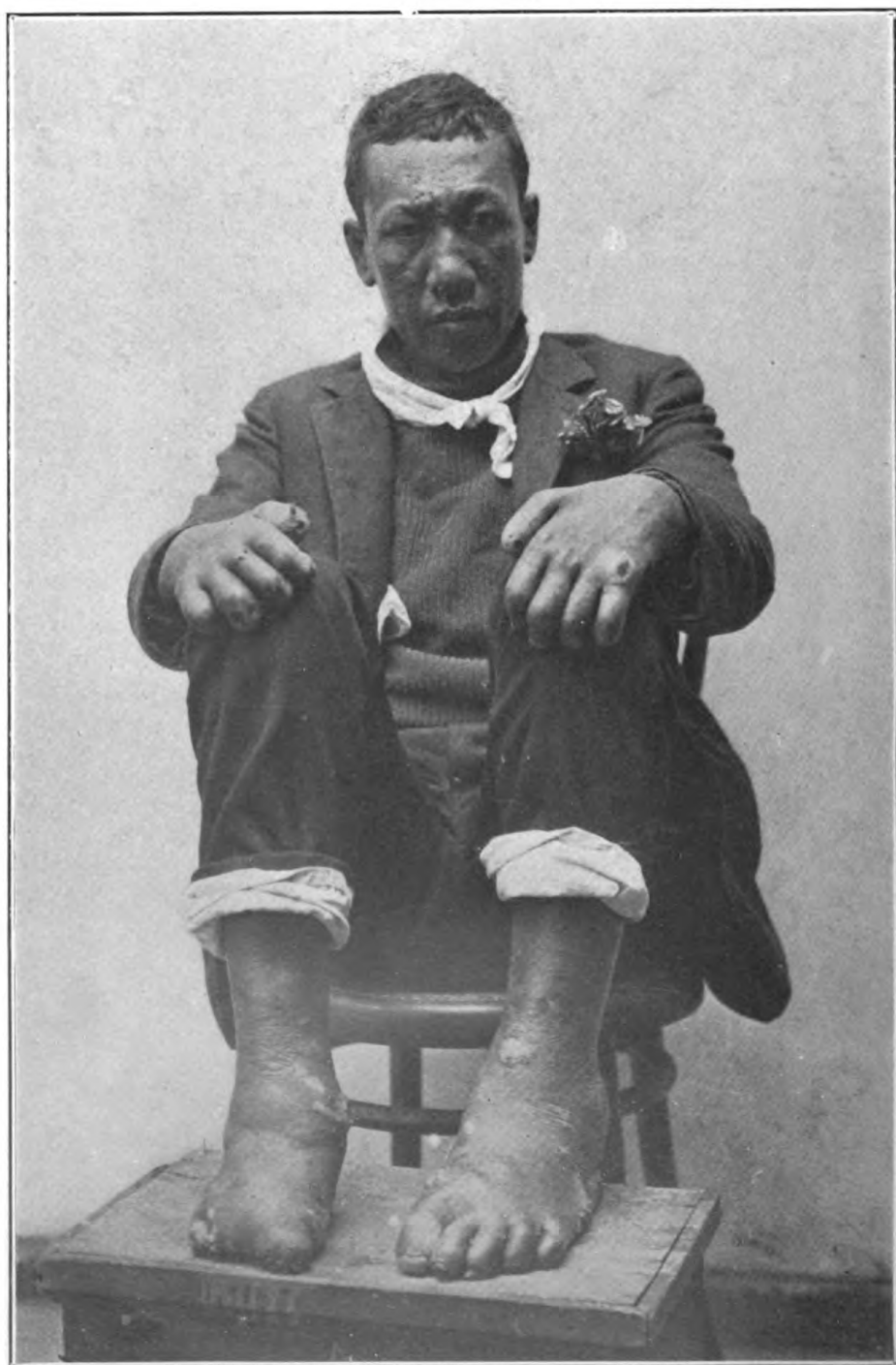


FIG. 24.

impression gained by seeing the condition described. Since the opportunity to see leprosy is not always present, and since, moreover, mental pictures once gained are apt to be dimmed by time, it seems reasonable to offer these pictures in the hope that they may serve to refresh the memory of those familiar with the disease and to act as a guide to those who have had less opportunity.

The pictures show a variety of leprosy lesions in different stages of development, and a few show how closely the disease at times may simulate other more common yet less serious conditions. No one could remain long in doubt as to diagnosis in cases so well marked as some of the pictures show, but the naval surgeon is most apt to be confronted with the disease in its earliest stages.

Remembering certain suggestions made by Dr. Wayson at the time of my visit, I submit the following method of examination of a suspect.

First. Search for areas of thickened skin.

Second. Look for nodules beneath the skin, lobes of the ears, face, hands, etc.

Third. Feel along the course of the ulnar nerve. This may be found palpable as a firm cord either with or without nodules upon it.

Fourth. Look for paralyses, atrophies, œdemas, or other trophic disturbances in the area of distribution of the ulnar, facial, or other nerves.

Fifth. Search for punched out ulcers on palms of hands or soles of feet.

Sixth. Make a systematic search for areas of anesthesia.

Seventh. Express a drop of blood or serum from the region of a nodule or other suspicious lesion and stain as for tubercle bacilli and look for the lepra bacilli.

Eighth. Examine the nasal septum for signs of ulceration or discharge and examine the discharge for lepra bacilli. (This last much-talked-of sign of leprosy, so valuable when present, is in Dr. Wayson's experience, found in only a small percentage of the cases.)

The photographs are numbered and the salient features of each herewith pointed out.

No. 1. Early case; cheek shows roughened slightly thickened skin distinctly noticeable when pinched between thumb and forefinger.

No. 2. Early case; cheek shows thickened area with slight, œdematous swelling of face.

No. 3. Early case; roughened skin of cheek, nodule on ear.

No. 4. Well marked case showing diffuse, leathery œdema.

No. 5. Slight œdema, few small nodules.

No. 6. Œdematous swelling of face occurring in a patient whose nodules are of longer standing. Much of this diffuse swelling will

eventually subside, followed possibly by facial paralysis. Eyebrows are falling out.

No. 7. Nodular type but so situated as to strongly suggest acne rosacea. Eyebrows gone.

No. 8. Leonine facies, typically leprous, old case. No eyebrows.

No. 9. Macular type; not unlike chromophytosis.

No. 10. Macular type; extensive skin involvement; not unlike leukoderma.

No. 11. Suggests ringworm.

No. 12. Suggests ichthyosis.

No. 13. Ulnar nerves attacked; early stage, marked œdema.

No. 14. Ulnar nerves attacked; later stage, slight œdema.

No. 15. Ulnar nerves attacked; still later, atrophy and slight contractures.

No. 16. Ulnar nerves attacked; later stage, marked atrophy and contractures.

No. 17. Palmar ulcer, not unlike syringomyelia; also contraction of hands and few nodules on face.

No. 18. Plantar ulcers, not unlike those seen in spinal cord lesions.

No. 19. Early stage; leprous facial paralysis.

No. 20. Late stage; leprous facial paralysis.

No. 21. Leprous ulnar nerve involvement. (At times a leprous process is so localized that surgical removal has been followed by apparent cure.)

No. 22. Late mixed lesions; skin involvement, atrophies, contractures, ulcers.

No. 23. Late mixed lesions; contractures, absorption of toes.

No. 24. Late mixed lesions; contractures, nodules, ulcerated nodules, absorption of phalanges of hands and feet.

VISION IN RELATION TO MARKSMANSHIP.¹

By Surgeon E. J. Grow, United States Navy.

During the winter of 1911, by direction of the Commander in Chief of the United States Atlantic Fleet, a number of gun pointers and trainers were sent from various battleships, then at anchor in Guantanamo Bay, Cuba, to the hospital ship *Solace* for ocular examination. This with the view of determining the relation that visual acuity has to accurate shooting; also as to whether the pointers and trainers should be selected with more consideration as to vision than is now required, to the end that the maximum efficiency in gunnery may be attained in so far as the eye is concerned.

¹ Information gathered from the ocular examination of 270 heavy-gun pointers and trainers of the United States Atlantic Fleet.

It will be remembered that for the past three years a visual acuity of 20/15 in the sighting eye and 20/20 in the other eye has been required by Navy general order before a man can qualify for the rating of either gun pointer or trainer. This means that with the eye to be used in sighting the applicant must read the test letters at a distance of 20 feet, which the so-called normal eye must approach to within 15 feet in order to read. This might seem paradoxical were it not for the fact that a vision of 20/20, which is generally accepted as normal, is in reality a very low standard. Many individuals have vision far in excess of this; in fact, a vision of 20/15 would more justly represent normal vision.

Several years ago investigations were carried out which showed that 78 per cent of all the gun pointers examined and then in the service had a vision of 20/15 or better in at least one eye. This was done prior to the time when any exceptional vision was required to enable the men to qualify for the rating, and shows that by natural selection over three-quarters of the men had this good vision. Later it will be shown that a like degree of visual acuity entails a proportionately small amount of astigmatic error.

Before the present examination was commenced, test letters were constructed which exactly subtended, vertically and horizontally, at the distance indicated, an angle of 5° at the nodal point of the eye. The component parts of each letter subtended an angle of 1° (Snellen's principle). They were of the "unlearnable" pattern used in the Navy which precludes the possibility of the examinee aiding his vision by previous memorization of the letters. These letters were of the gothic type, as shown in Figure 1. Many of the vision test charts in common use vary so much in the size of the letters supposed to be seen at the same distances that the tabulation of visual acuity will depend to a great degree upon the particular chart used. Unless a new set of letters is presented each time a man is called upon to read, he unconsciously remembers many of the letters, and the value of the test is impaired to that extent. Both factors lead to confusion, and therefore the above precautions were taken to insure accuracy in our tests.

In addition, every man was examined by the "International" test (Landolf's broken circles), Figure 2. In a similar way the circles were carefully drawn to conform to Snellen's principle. A separate series for each foot in distance were made, thereby giving the results of visual acuity very accurately. It was found that the letters could be read almost exactly 2 feet farther away than the circles of the "International" test, subtending the same angle—that is to say, a man with 20/15 vision by the former test would have only 20/17 vision with the latter. Besides its universal adaptability, the "International" test is unquestionably the more accurate as a test

for vision, but its disadvantages are many and important and it is very doubtful if it ever becomes of general use.

Figures 1 and 2 have been so constructed as to correctly represent a vision of 20/8 by their respective methods, when properly viewed. If the reader will close one eye, and with the other eye observe these charts in good light at a distance of 20 feet, he will have an idea of the visual acuity possessed by the sighting eye of the best-visioned gun pointers in the United States Atlantic Fleet. For at this distance a few will read every letter correctly, and also tell in which direction the openings in the circles point, in either case using one eye only.

Two hundred and seventy heavy-gun pointers and trainers were subjected to examination. This included vision, refraction of each eye under a cycloplegic (homatropin 2 per cent, cocaine 2 per cent), the range of accommodation before, during, and after cycloplegia, effect of myotics, muscle tests at varying distances, and ophthalmoscopic examination in every case. Only the results of vision, refrac-

P H E
A O N
F N T
P Y A

FIGURE 1.

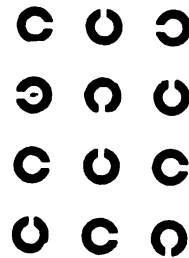


FIGURE 2.

tion, and ophthalmoscopic examinations will be considered in this article. The additional data obtained are to be used in connection with future investigations. All these men were in excellent health, living under excellent hygienic conditions. Their ages range from 17 to 37 years, as indicated in the accompanying diagram, Figure 3.

It will be noticed that the great majority of the pointers and trainers of the heavy guns in the United States Navy are comparatively young men.

The vision and manifest refraction were first taken, followed by the static refraction and a postcycloplegic refraction which was determined several days later. Care was taken to ascertain the full error, especially the astigmatism in each case.

The chart, Figure 4, graphically shows the vision and astigmatism present in each eye of all examined. The heavy continuous line representing the vision in the sighting eye (in 92 per cent of cases the right eye), and the narrow continuous line the vision in the nonsighting eye. The heavy, broken line represents the astigmatism in the sighting eye and the light, broken line the same condition in the other

eye. The amount of astigmatism is indicated vertically at the right in diopters. The double base line represents the level of so-called normal vision (20/20). The figures immediately below this line indicate the number of men examined, grouped in lots of 25. The fractions at the left indicate the vision.

It will be noticed from the chart that a large majority of the gun pointers have more than 20/20 vision. This is accounted for in part by the visual requirements to qualify for the rating, and in part by natural selection. There are only a few men whose sighting eye is below 20/20 and most of these have a vision only a little below that standard. It will be seen that for the men with an acuity of vision

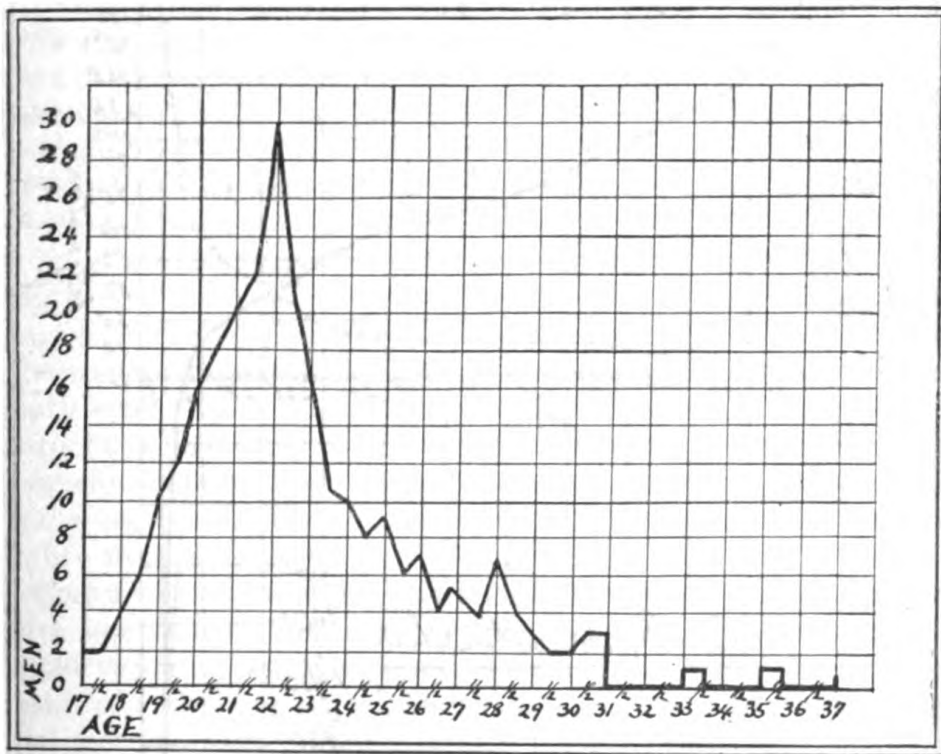


FIGURE 3.

above the average, the amount of astigmatism is extremely small, and as soon as vision falls the amount of astigmatism increases proportionately. The defect in vision could be accounted for in all these cases by the astigmatism, for when this was corrected by appropriate glasses the vision was brought up to normal or better. The highest astigmatism noticed in the sighting eye was 1.50 diopters, whereas in the nonsighting eye 1.75 diopters was found in a single case. Nearly 200 of those examined had an astigmatism of 0.25 diopters or less. In not a single instance was over 0.50 of a diopter of astigmatism found in a man with more than 20/15 vision. Thus it would appear that comparative absence of astigmatism was a desirable quality, and so it proves to be.

Astigmatism is the effect produced by the unequal refractive power in two principal meridians of the eye which are generally at right angles to each other. This condition may allow of a clear image of objects, say in the vertical meridian, but at the same time a clear image in the horizontal meridian can not be obtained, and only by a change in the accommodation of the eye can this horizontal meridian

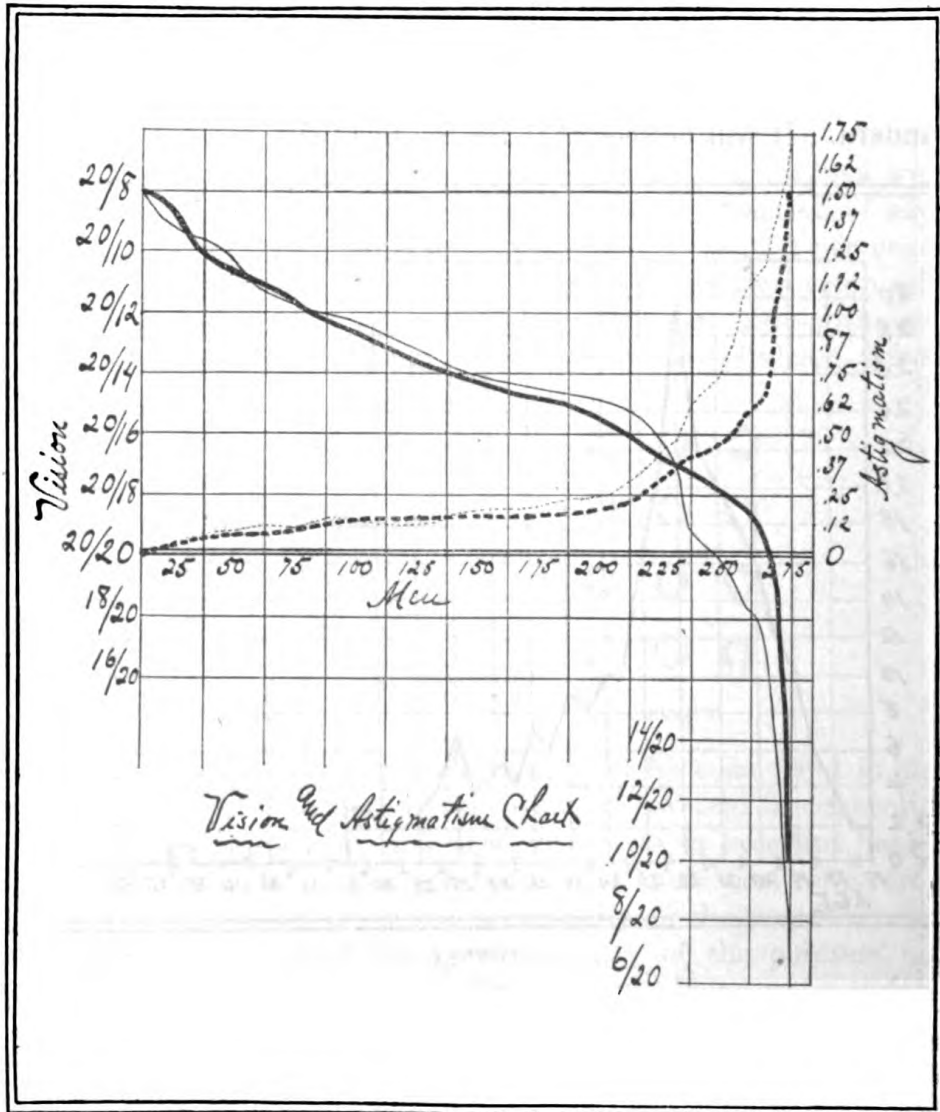


FIGURE 4.

be corrected, at a sacrifice, in turn, of clearness in the vertical meridian, and so on. It is next to impossible for an observer to control his accommodation at will, so as to eliminate the defect in any meridian, especially under conditions similar to those which our gun pointers have to meet.

The telescopic sights used on the large caliber guns in the United States Navy contain, in addition to a proper lens system, a glass on

which are etched two lines crossing at right angles, one vertical and the other horizontal, by the aid of which the gun is effectively aimed. The arrangement is such that the gun pointer is chiefly concerned with the latter and the trainer with the former. If the telescope is properly adjusted and the observer's eye is sufficiently free from astigmatism, he will see both of these lines distinctly at the same time and can clearly sight either line on the target as the occasion demands. Should considerable astigmatism exist it would be impossible for him to see both lines distinctly, at least one line would be more or less blurred, and if it happened to be the horizontal line that was indistinct the pointer would have trouble in accurately sighting his gun, or if the vertical line was in question, the trainer would experience a similar difficulty. Often the blurring of one of the cross lines will be so great that it will appear to be double. This happened in two cases to be mentioned later. The same may have happened with other men but not admitted, as there is a temptation for both pointers and trainers to minimize their ocular defects, to enable them to retain their rating, which entails an increase of pay.

It is possible that the eye can compensate for astigmatism of slight amount (0.37 D) by an unequal contraction of the ciliary muscle, only at the expense of eye strain and ocular fatigue, however. Experimentation with the Mark XI telescope showed that an astigmatic error of over 0.75 of a diopter slightly blurred one or the other cross lines, depending upon which line the eye was in focus for at the moment. It would appear that any astigmatism under that amount had a negligible effect as far as pointers and trainers using telescopic sights were concerned.

Consulting the records, it is found that there were but two men with less than 0.75 of a diopter of astigmatism but who have not 18/20 vision or better, and in one of these cases the defect was the result of a previous corneal ulcer, and of the men who had an astigmatic error of more than 0.75 of a diopter nearly all had a visual acuity of less than 18/20.

The practical point to be gained here is that dangerous amounts of astigmatism can be easily eliminated by the medical officer by simply passing upon the visual qualifications of the candidate to be examined. The visual requirements which until recently have been supposed to have been observed, viz, 20/15 vision in the sighting eye and 20/20 vision in the other eye, would further remove the possibility of dangerous amounts of astigmatism.

The records show that 20/15 vision practically eliminates the chance of anyone having over 0.37 of a diopter of astigmatism, which is a perfectly safe amount for purposes here considered.

There is no evidence to show that a higher vision than this is of any particular value when telescopic sights are used.

A reduction of visual acuity from 20/15 to 18/20, as determined by our method of examination by test charts, gives the reader an impression of far greater proportionate loss of real seeing power than actually exists. Two individuals, one having the former and the other the latter vision, will be found to have a nearly equal perception of general objects in outdoor life, and when telescopic sights of such power as are attached to the guns in the United States Navy are used, the difference is so slight as to be hardly appreciable. Experimentation with the Mark XI telescope has established this fact, which is well to remember in connection with the recommendations that follow.

Myopia was not found in a single instance among those examined. In one case, however, a myopic astigmatism of -0.25 cyl., ax. 180 was present in each eye.

Certainly a myope could hardly be expected to do well on an ordinary rifle range unless he wore glasses correcting the defect, in which case he would experience no difficulty in marksmanship as far as eyesight was concerned, provided his vision was sufficient after correction. On board ship it is impracticable for the pointers and trainers to wear correcting glasses. Therefore a nearsighted person would have no place at the telescopic sights of the heavy guns in the Navy, as the instruments are rigidly set at a certain fixed focus prior to going into action by someone in authority, and could not be frequently changed to suit the convenience of nearsighted men who might be suddenly called upon to use them. With us the entire subject of myopia can be easily eliminated by observing definite visual requirements. With hyperopia it is entirely different. Here a man can have little or much of this error of refraction and still may satisfy our vision tests.

Among those examined the static hyperopia varied from 0.12 of a diopter to 4.50 diopters. The majority were found to have from 0.37 of a diopter to 1.00 diopter. (See Fig. 5.)

A gun pointer with 4.50 diopters of hyperopia must accommodate that much in order to see clearly at a distance. The same would be true if he were to sight through a telescope with a focus fixed for an emmetropic eye. Should he be unable to hold this amount constantly, or through sudden fright or excitement should his accommodation suddenly relax and pass from his control, he could not see a ship at 10,000 yards and therefore would be deprived of proper command of his telescopic sight.

In action, likewise in practice, it would be unwise to trust the effectiveness of an entire gun's crew to a pointer or trainer with such a defect. Fortunately there was only one man found with this amount of hyperopic error, though there were several who had only slightly less. The older the man, and generally the more experienced

and valuable to the service as a gun pointer, the more serious would this defect become and the more difficult to control.

There were four men from the entire number examined who complained that after sighting with the telescope for a time their eyes became tired and that they could not see well—"everything blurred," as they expressed it, until they had rested their eyes or rubbed them hard, after which they could continue for a while, when the same process had to be repeated. Examination showed that three of them had a hyperopia of 4.00 diopters and over, and it is quite probable that fatigue had made it impossible for them to continuously

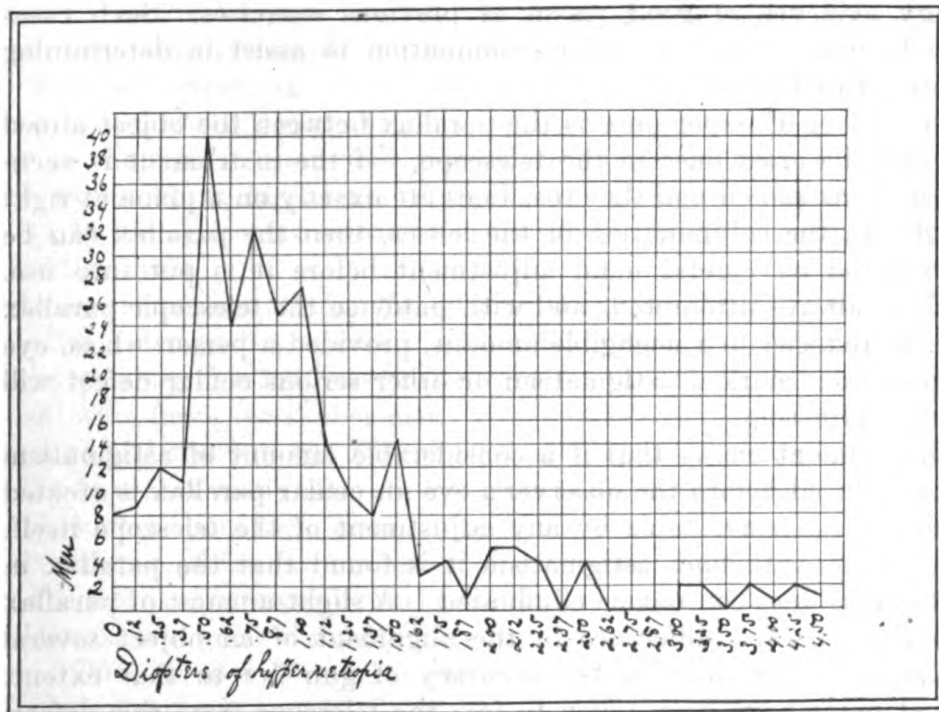


FIGURE 5.

hold that much accommodation, and it had relaxed, causing the blurred vision.

From whatever cause such men would be at a disadvantage, for in any modern naval engagement that is likely to take place there would be little opportunity given gun pointers to rest their eyes without seriously interfering with the efficiency of the gun. Exactly what amount of hyperopia would represent the maximum of safety has not been entirely satisfactorily determined, but it would not be safe to accept men with over 3.00 diopters.

Occasionally a condition of spasm of accommodation exists, due to long-continued eye strain, excitement, fear, etc. This will occur most readily in men who have important errors of refraction which particularly tend to fatigue the eye; rarely in normal eyes. Fortu-

nately this sudden spasm is not frequently found among gun pointers, as far as can be determined, for those who are subject to this peculiar trouble are for the most part eliminated early in the competitive trying-out process. When it does occur the individual is utterly unable to use his telescopic sight until the condition passes off—a variable length of time. Neither a gun pointer nor trainer who is subject to this peculiarity should be kept in the rating. To reduce the possibility of such men remaining, officers in charge of guns' crews should observe the signs of sudden blurred vision among the men under their command and inquire into all complaints of inability to see clearly, especially arising among those who gave every evidence of good vision at previous exercises. Such cases should have a careful ocular examination to assist in determining their future fitness.

A subject of importance is the parallax between the object aimed at and the cross lines in the telescope. If the instrument is accurately constructed and the cross lines are exactly on a plane at right angles to the columination of the lenses, then the parallax can be eliminated by careful hand adjustment before it is put into use. This is always attempted, and with patience the telescopic parallax can be reduced to a negligible amount, provided a person whose eye is free from marked astigmatism or other serious ocular defect will do the adjusting.

Experiment shows that if a considerable amount of astigmatism is introduced before the observer's eye an ocular parallax is created which is not correctable by any adjustment of the telescope itself. In persons with high astigmatism it is found that the parallax in both cross lines can not be eliminated. A slight amount of parallax makes a marked difference in the alignment of an object several miles away and reduces the accuracy of gun fire to that extent. Great pains have been taken to free the telescope from this defect, but heretofore the eye has evidently not been considered as a source of parallactic disturbance. It is found that an astigmatism of considerably over 0.75 of a diopter is necessary to introduce a detectable amount of ocular parallax. Fortunately, danger on this score can be easily avoided by simply exacting a vision of 20/15 in the sighting eye of all applicants desirous of qualifying for the ratings of gun pointer and trainer. This would insure freedom from amounts of astigmatism sufficient to cause this trouble at the beginning of the individual's career. Plenty of men can be obtained with such vision or better.

It must be borne in mind that most of the telescopic sights are made so that they can be set in focus for all objects beyond 1,600 yards for normal eyes, the adjustment for parallax alone remaining. These changes are generally made by some one of experience. The

telescope is then fixed in position, and the gun pointer and trainer must do his sighting through the instrument as he finds it. A moment's reflection will convince one that such an arrangement is a necessity, as frequent and individual readjustments of the telescope during action would be impracticable. This being the case, the greatest care should be taken that the initial adjustment is accurate.

Several complaints were made by men who did not make particularly good scores to the effect that their telescopes were not accurately set in focus by the person having that duty to perform. Whether this reason was real or imaginary the writer can not say. Such an accident is not beyond the realm of possibility, especially if the adjusting was made by one who had a considerable amount of uncorrected refractive error. As several men in succession may have to use the telescope as it is set, it would seem that the only way to eliminate a reasonable possibility of such an accident occurring would be to be certain that all who adjust or who would be likely to use telescopic sights were free from dangerous amounts of refractive error.

As an aid in determining the relation that eyesight bears to shooting, the individual scores of marksmanship during the fleet record target practice for 1910, as well as the small arms (rifle) record of those who fired, was obtained. Comparisons among heavy-gun pointers and trainers are difficult and somewhat unsatisfactory, due to the fact that many altering factors enter into the final credited score, such as penalties, errors in spotting the individual shots, lack of experience, difference in caliber of guns used, poor trainers lowering the scores of ordinarily excellent pointers, and vice versa. Nevertheless, certain general results have been obtained which are instructive. Pointers of 8, 10, and 12 inch guns alone are considered in the following tabulations:

In the first place the scores of 20 men whose vision was in each case 20/10 or better in the sighting eye were compared with the scores of an equal number whose vision was below 20/20 (16/20 average). This comprised all the men available who fell into these two groups and represents the extremes of vision among the entire number examined. It was found that the former averaged 4.18 hits out of 5 shots (83.6 per cent), while the latter averaged only 4.15 hits out of 5.23 shots (79.7 per cent), a record slightly in favor of those with the maximum vision. When considering the rapidity of shots and hits, which is a most important feature, it was found that the group with highest visual acuity made on an average 1.370 hits per gun per minute, with 1.819 shots per gun per minute, while the group with the least visual acuity made 1.616 hits per gun per minute, with 2.215 shots per gun per minute—a result only slightly

in favor of those with the better vision. A few men who would not have been allowed in the rating if proper visual requirements had been observed lowered the average of those having the less vision very materially.

For purposes of an additional comparison, the entire number of men examined was divided into two groups, one in which the vision in the sighting eye was 20/15 or better and the other in which the vision in the sighting eye was less than 20/15 (10/20 a minimum). Having due regard to the caliber of the guns fired, it was found that the former made an average of 81 per cent of hits against 78.9 per cent of hits for the latter. When the time factor was considered, it appears that the average for those with the better vision was 1.688 hits per gun per minute out of 2 011 shots per gun per minute, whereas the average for those with the poorer vision was 1 691 hits per gun per minute out of 2.099 shots per gun per minute; a record but very slightly in favor of those with the better vision.

The number of shots fired in a given time depends almost entirely on the ability and training of the guns crew, the trainer and pointer being relied upon for the hits out of the shots afforded. The difference is so slight in the two groups mentioned that it is reasonable to suppose that the question of vision, at best, plays a negligible part toward the efficiency of marksmanship among gun pointers and trainers using telescopic sights, provided the vision does not fall below a certain level; and provided further that the astigmatism is not of such amount as to introduce ocular parallax or blur one of the cross lines in the telescope.

One man who acting as trainer for two 12-inch guns, with 17/20 vision in the sighting eye and only 0.37 of a diopter of astigmatism, made 12 hits out of 12 shots with both guns, an excellent record; whereas the next man examined, acting as pointer of an 8-inch gun, with the same vision, made only 2 hits out of 6 shots; but it was found that he had 1.25 diopters of astigmatism and had complained of eye strain whenever he tried to sight with the telescope.

It has been frequently noticed that those men with large amounts of astigmatism do not shoot particularly well, but not always has it been found to be the case, though only rarely has the reverse been true. The above case is a marked example among several discovered.

There is evidence to show that in some cases the longer the man is engaged as pointer or trainer the poorer his vision becomes. Several men have complained of this, saying that they realize that they have not as good eyesight as they had before they were constantly kept at practice. To exactly what degree this is true, it is impossible to state from the present data, but it is not unlikely that there is a tendency for the vision to be lowered somewhat as the man becomes older and the additional strain of pointing or training is experienced. This is

emphasized by the fact that most of those who have had several years of gunnery experience to their credit, and who are recorded as among the best shots in the fleet, not infrequently are found to have a visual acuity below the former requirements. To reject such men for slightly defective eyesight, provided it was not due to progressive organic disease, would seem to be absolutely unwarranted, if the best interests of the service are to be considered. It is a long, tedious, and expensive process to train these men, and when so trained they are of such great value that reasonable concessions should be made in respect to their visual requirements, especially when evidence shows that a slight deterioration in sight, very little, if any, impairs their efficiency under the conditions in which they are called upon to act. The time to consider vision is when the applicant first presents himself for the rating of gun pointer or trainer. A sufficiently high vision requirement, then, will obviate most of the troubles that are likely to occur later. While nothing is to be gained by requiring more than 20/15 vision, that much, however, is advisable, in order to eliminate in an easy and practicable way the defects previously mentioned. Later, if the vision falls below 18/20, a careful ocular examination should be made by some one interested in that line of work in order to exclude beginning organic disease, effects of injuries, etc., and the case then decided on its merits.

Examination of all gun pointers and trainers should be made at least once a year by the medical officer of the ship to determine this point. If the original requirement of 20/15 is exacted, very few cases will ever come up for special examination, which is a very practical point.

Some interesting individual conditions were discovered among those examined, a few of which are given below.

1. E. C. S., a 12-inch gun pointer, had a well-marked scar near the center of the right cornea, the result of a previous ulcer. It looked as if the opacity would prevent his having anything like good vision, but it was found on examination that he had a large angle "gamma," and that his line of vision passed slightly to the nasal side of the opacity, giving him a visual acuity of 20/18 (static refraction, R. E. +0.50+50, ax. 90). He suffered from anisometropia. The left eye was considerably hyperopic (+4.25 D), and from lack of accommodation could not use that eye in sighting with the telescope. He relied entirely on his injured right eye for sighting. He made 4 hits out of 4 shots with the 12-inch gun in 1 minute and 56 seconds, which was one of the best records in the entire fleet.

It should not be inferred that such a case would be a proper selection for a gun pointer, but rather an exception, which gave good results in face of ocular defects which should be classed as prohibitive.

2. H. C. B., trainer of a 12-inch gun, vision 20/15 each eye, complained that his eyes would "water" when using them at the telescope, and that his sight would blur after looking steadily for any length of time; also that he liked to frequently rest his eyes when at the sighting hood. Such a man might be compelled to take a rest at a

most inopportune time in actual warfare, and as a trainer of both 12-inch guns, would reduce the efficiency of an entire turret. Examination of his eyes showed that his accommodation was very active, the slightest irritation produced abundant lacrimation, and the eyes were hypersensitive. There was very little error of refraction.

It would be inadvisable to continue such a man in this rating even though his work was given as "satisfactory." Similar cases would pass our preliminary visual requirements, hence the need of constant observation of these men after they have entered upon their duties.

3. H. F. H., pointer of an 8-inch gun, vision R. E. 17/20, L. E. 15/20, fired two years to qualify as a pointer and failed. States that he has had more or less trouble with his eyes for some time and that he worked with searchlights considerably and believes that his eyes have been injured thereby, as he can not see to read well. He was apparently suffering from retinal asthenopia. In two record practices he made only one hit out of four shots in each practice. (Records show that he was given the wrong range in the last practice, which was not his fault.) Has very little astigmatism, and it is quite likely that the searchlight has had a deleterious effect on his eyes.

Instances have been known where the ocular structures have been affected by working in close proximity to the powerful radiations from these lights. Such cases should be rejected. The diminished vision alone would at original rating have been a bar if requirements had been observed.

4. A. P. C., trainer, 12-inch gun, vision R. E. 15/20, L. E. 20/15, states that he is obliged to sight with the left eye when either using the telescope or shooting with the service rifle. With the former it is of no special inconvenience to use the left eye, but it is very awkward to sight the service rifle with that eye, and especially as he is right handed. He is a poor shot with the rifle, and has +1.00 diopter of astigmatism, ax. 105, in the right eye and almost none in the left. This accounts for his diminished vision in the right eye. He finds that in spite of the awkwardness he does better by using the eye with the least astigmatism.

This case is characteristic of several others, indicating that astigmatism of more than small amounts is a frequent cause of ocular inefficiency in shooting.

5. P. F. S., pointer, 8-inch gun, vision R. E. 20/18, L. E. 20/11, states that he sights with his left eye when using the telescopic sight, simply because he sees more distinctly. Is very nervous and states that he never was able to hold the service rifle steady. He is about the poorest rifle shot among all those examined, yet in pointing the 8-inch gun his work was satisfactory.

There is a marked difference in the character of the duty between pointing an 8-inch gun and sighting with the service rifle. Several men did well with the former but not the latter. The temperamental qualifications are not a part of this discussion, but they are very important and can only be properly weighed by a thorough trying out process at the gun.

6. G. W., pointer, 8-inch gun, vision R. E. 20/16, L. E. 20/15, states that his eyes grow tired easily and feel weak when he is kept waiting at the sighting hood of the telescope for any length of time, and that the condition of his eyes bothers him so that at times he does not care whether he hits the target or not. This man's static refraction

tion was OD $+0.75 +0.25$ ax. 20; OS $+0.75 +0.12$ ax. 20. While it is not intended to deal with the conditions of the extra ocular muscles as a factor in shooting, in this paper, yet this case is so suggestive of other similar conditions that it is thought wise to mention it. This man had an exophoria of 5 Δ at 20 feet, 14 Δ at 15 inches, and a right hyperphoria of 2 Δ .

There are very few eyes that would not rebel with a double muscular imbalance of this nature, and it is not surprising that he should have had trouble. Such a man would not be a good selection for a gun pointer, yet he would readily pass our present physical requirements. Men who shoot use but one eye in sighting; the other is closed or the image is disassociated, hence a muscular imbalance is in a measure relieved during the act of aiming; but as soon as binocular vision is resumed the ocular strain and fatigue returns, all of which tends to deprive the man of that ocular equilibrium which is conducive to the best effort.

7. F. A. G., pointer, 8-inch gun, vision R. E. 16/20, L. E. 15/20, static refraction R. E. $+50 +1.25$, ax. 180, L. E. $+0.50 +1.50$, ax. 180. This man stated that he could not see very well when using the telescopic sight. The horizontal cross line appeared double, whereas the vertical line was nearly always single.

This is of importance, as it is the gun pointer's duty to keep the horizontal line on the object to be fired at, continuously, and if the line seems double he can not effect a satisfactory aim. A slight error here means much when the object is miles away. The defect can be most easily avoided by requiring sufficient vision to eliminate astigmatism of any such amount as could cause this condition. Another case occurred similar to the above which further emphasizes the fact that astigmatism of considerable amount should be a cause for rejection for those engaged in telescopic pointing and training of the guns in the United States Navy.

8. D. McK., trainer, 12-inch gun, vision R. E. 17/20, L. E. 16/20, 38 years of age, static refraction R. E. $+1.50 +0.37$, ax. 100; L. E. $+1.50 +0.50$, ax. 80. Although this man has a visual acuity below the requirements for his rating, yet with the two 12-inch guns which he trained he made 12 hits out of 12 shots in 2 minutes and 58 seconds (previously cited), and in the record practice the year previous he practically equaled the score. But this man has had 11 years of constant practice in this line of work and has become highly proficient.

This case is illustrative of several, showing that with comparatively poor vision according to a gun-pointer's standard, most excellent shooting is yet possible, especially when supplemented with years of experience, and telescopic sights are used. It should be noticed that he had only a moderate amount of astigmatism, however. It would be unwise not to retain men who fall within this class, and some provision should be made by regulation to allow them to continue in their rating as long as they make excellent records, even if the vision has fallen some during their years of practice. To what extent it is safe to permit the vision to fall, without question, is a difficult prob-

lem. From evidence gathered from all examined it would seem that it would be perfectly safe to accept a reduction to 18/20 in the sighting eye among those who had previously satisfied the maximum requirements, and to a minimum of 15/20 in the other eye provided no organic disease or other defect prohibitive of good shooting existed, as determined by some one qualified in this line of work. In other words, a vision falling below 18/20 should call for a thorough ocular examination. It would be a doubtful experiment to permit men to continue in such important positions as gun pointers and trainers after the vision had fallen below the amounts stated, except in the most exceptional cases and then only after a careful examination of the eyes had been made.

Another man complained that he did not wish to be a gun pointer because he did not like the duty and took no interest in the work whatever. His heart was set on being a laundryman, where the recompense was greater. Although it was found out that he had previously done satisfactory work as a pointer, yet it is questionable whether such a man should be retained in the rating unless his very best energies will be devoted to the work.

Not a single case out of the entire 270 was found to be suffering from any fundus trouble, indicative of a pathological condition. Curiously enough, however, there were seven men who presented well-marked Gunn's dots around the macular region (described first by the late Dr. Marcus Gunn and sometimes spoken of as Crick's dots from the name of the patient in whom they were first exhibited). Although they made a striking appearance when seen in abundance, yet no defect in vision can be attributed to them, the average vision being 20/13 and the lowest 20/20 among those who presented the condition. They were found in both eyes in every case. No pathological significance can be attributed to them and they are mentioned only because they might be taken as an indication of serious retinal or choroidal disease by those not accustomed to their appearance. The same condition has been noticed frequently among the midshipmen at the Naval Academy and should not be a cause for physical rejection.

It is often heard that men with dark irides do not make as good shots as those with eyes of lighter hue. Careful observance was made of this point, and it is very doubtful if this theory has any basis in fact. It is true that 72 per cent of the pointers and trainers examined had light eyes, but that is nearly the proportion found among the average crew; consequently there is a larger percentage of men of that type from whom to select. As to the relative shooting ability of these two classes of men, no difference was discovered worthy of record.

In addition to heavy-gun shooting, some attention has been given to firing with the service rifle. Individual scores were obtained from

nearly all of the 270 men previously considered who fired, on the range on shore, at the varying distances of 200, 300, and 500 yards. The average scores of those who had better than 20/15 vision were compared with those having less than 20/15 (10/20 as a minimum), and it was found that the men with the better vision averaged rather the better score in proportion of 108 to 99, 150 points being the maximum.

As these figures were computed from a large number of men shooting at different times, many features other than vision would enter to influence the records, and the slight advantage above given to the credit of those with the better vision should not be taken as the standard of relative advantage that this class of men experience.

When shooting at a large white target, the kind generally supplied at rifle ranges, any vision that will permit the marksman to see the target with some distinctness will permit of his making a good score, especially so if he is aided by judgment and experience. Consequently men with only 10/20 vision will often do as well as those who possess the best eyesight. Frequently men have stated that they were unable to see the bull's-eye, but realizing that it was in the center of the large white target, which could be seen, they were able to make excellent scores. This has often been proved to be true. Shooting on a range or in a gallery is far different from shooting in actual warfare. Under the latter conditions, a man to make a good individual shot must at least be able to first discern the object before he can expect to aim; and the object may be small, indistinct, and far away so that good eyesight is necessary to see it; while under the former condition the target is so large and plain that the average man has little trouble in seeing it even if his vision is very poor. Both may do equally well on the range, but the man with the better vision will have a material advantage when called upon to pick out and shoot at an object under unfavorable conditions, as would often happen in actual service.

The exact relationship that vision bears to rifle shooting has never been satisfactorily determined. Many statistics are given by writers on this subject to show that men with comparatively poor vision will make just as good scores as those with exceptional vision and that it is a waste of material to reject those men simply because their vision is below normal. These statistics are based on range or gallery firing and are therefore of no value in determining the real relation of eyesight to marksmanship. Contrary to the often expressed opinion, the writer believes that exceptional vision is of some advantage even on rifle ranges and in galleries.

The members of the United States Marine Corps Rifle Team for 1911 were refracted and had their vision taken prior to entering upon

their preliminary practice at Wakefield, Mass. It was found that all except one man had less than 0.37 of a diopter of astigmatism, and he had exactly that amount. Their vision averaged 20/14 in the sighting eye. These men were selected from a large number of try-outs, not from visual tests, but from their ability to shoot well, and it is interesting to note what a small amount of astigmatism was found, as well as the fact that this team won the National Trophy Match for 1911 against 42 competing rifle teams at Camp Perry, Ohio. These men wore a specially constructed shooting glass (Hallauer No. 64), which also included their astigmatic correction and brought their vision up to 20/10 or more in each case. To obtain the best results, even the little astigmatism which they had was corrected.

It is well recognized that other qualities than vision are necessary to make a man a good shot; at the same time it would seem in this case that the expert shots with the rifle were obtained from those men who had most excellent vision, accompanied with a minimum of astigmatism. Whether they would have done equally well with the vision at 20/20 or lower is problematical. However that may be, the members of the Marine Corps team above mentioned were given the advantage of exceptional vision and did most creditable work.

The accurate correction of the astigmatism not only aids in clearing up the definition, but relieves a certain strain on the eye, which is of importance to those whose eyes are naturally under a severe strain incident to long and continued sighting, and especially to those who are suffering from other errors of refraction as well.

CONCLUSIONS.

Among the gun pointers and trainers of the United States Atlantic Fleet who were examined, a reduction of visual acuity was almost invariably commensurate with, and due to, the astigmatism present.

Astigmatism of more than 0.75 of a diopter blurs and often doubles one of the cross lines in the telescopic sight and thereby interferes with accurate aiming.

Astigmatism of less amount may be considered as having a negligible effect for purposes here considered.

High degrees of astigmatism introduce an ocular parallax which can not be eliminated even though the telescopic parallax is completely removed.

A visual acuity of 20/15 will, in a simple and practical way, eliminate all cases of astigmatism and myopia which by any chance would reduce or interfere with the most accurate aim which is possible to be obtained through telescopic sights. Plenty of men can

be obtained who have this vision. Nothing is to be gained by a higher visual requirement.

The elimination of dangerous amounts of hyperopia can not be accomplished by our simple visual tests. When this condition is suspected a special ocular examination should be required to determine the amount. Hyperopia of over 3.00 dipoters should be cause for rejection.

Exceptional vision is no guarantee of good shooting and ordinary or slightly reduced vision (18/20), if associated with less than 0.75 of a diopter of astigmatism, is of no hindrance when United States Navy telescopic sights are used.

Twenty-nine per cent of the gun pointers and trainers examined failed to meet the visual requirements which have been in force since July 1, 1908. Many of these men have had several years' experience in heavy gun practice and made most excellent scores. A slight diminution of vision often follows long continued practice with telescopic sights. Such men should be allowed a moderate reduction in visual acuity so that they will not be disqualified for an ocular defect when it is of such amount as to be of no determinable importance. The services of highly trained gun pointers, who by virtue of their experience are of incalculable value, will in this way be saved to the Navy.

Care should be taken that the individual who adjusts and fixes the telescopes in focus is free from any error of refraction which would preclude the possibility of others, who may be called upon in succession to use the same sight, from obtaining an accurate aim.

It is impracticable for gun pointers to wear glasses correcting their visual error and equally so for each individual to change the telescopic sight to suit himself. Consequently it is imperative that the eyes of all who are to use these sights should be sufficiently near normal so that the gun pointers can instantly use any telescope as they find it with a maximum of aiming efficiency.

In reference to small-arm (rifle) shooting, an entirely different problem is presented. Any attempt to draw satisfactory conclusions as to the relation of eyesight to marksmanship is valueless when an ordinary service target, such as is generally used, is the object. Men of experience in rifle shooting, with markedly reduced vision, will generally make excellent scores even though the bull's-eye is invisible, provided their vision is still sufficient to allow them to just discern the target, which is large, white, and made as distinct as possible.

There is an intensely practical side to this important subject of the relation of vision to marksmanship which must be carefully considered. In view of all the evidence obtainable, it is believed that the best interests of the service will be furthered, as far as eyesight

can possibly be concerned in relation to shooting with telescopic sights, by adopting the following requirements:

1. That all candidates for the *original* rating of gun pointer or trainer should have a minimum visual acuity of 20/15 in the sighting eye and 20/20 in the other eye.

2. Hyperopia of over 3.00 diopters is cause for rejection.

3. The medical officer of each ship should carefully reexamine the eyes of all men holding these ratings, at the beginning of each calendar year, entering the vision in the health record (abstract) for future information. If the vision has fallen materially since the last examination or evidence of asthenopia or disease exists, an ocular examination should be made by some one trained in ophthalmology, who will enter his findings and recommendations in the health record. Should the individual's condition be such as to warrant the revoking of his rating, full information of the case, including recommendations, should be forwarded by the medical officer through official channels to the department for consideration and final disposition. Very few will fall into this class if the original visual requirements are rigidly enforced.

4. Gun pointers and trainers who have served as such during one enlistment may on subsequent enlistments be accepted with a minimum visual acuity of 18/20 in the sighting eye and 15/20 in the other eye, provided such reduced vision is not due to progressive organic disease, myopia or astigmatism of over 0.75 of a diopter. Entry is to be made in the health record to such effect.

5. In all cases vision should be tested by the so-called Navy "Unlearnable vision test card," as there is considerable temptation to learn the letters found on ordinary charts by those especially anxious to secure or retain the rating of gun pointer or trainer.

TECHNIQUE OF A WASSERMANN TEST IN WHICH GUINEA-PIG COMPLEMENT IS NOT REQUIRED. EMERY TECHNIQUE. NOGUCHI REAGENTS.

By Medical Inspector E. R. STIRT, United States Navy.

In the United States Naval Medical Bulletin for April, 1911, I described a simplified technique for the Wassermann reaction as employed by Emery (the Lancet of September 3, 1910), and stated that certain features of this technique made it peculiarly applicable to use on board ship. In the method the complement is supplied by the human serum to be tested and eliminates the necessity for the serum from guinea pigs.

In the Lancet for March 4, 1911, Emery again detailed his method, and in addition brought out the advantages of his technique from a standpoint of a reliable quantitative estimation of the strength of a reaction.

This quantitative feature I have now employed for about nine months, checking my findings in every instance with a test according to Noguchi's method and with uniformly satisfactory results.

The dilutions of antigen used in the laboratory of the United States Naval Medical School have as a routine been as follows: 1 to 20, 1 to 40, 1 to 80, 1 to 160, 1 to 320, and 1 to 640. Where a positive reaction with a dilution of antigen of 1 to 640 has been obtained, tests have been made with dilution of 1 to 1,280 and 1 to 2,560. In four cases absolute inhibition of hemolysis was obtained in the tubes with so diluted an antigen as 1 to 2,560. These cases were, in three instances, secondary syphilis with pronounced rash, and in one case, congenital syphilis, diagnosed as Hodgkins disease, which has responded in marked improvement under specific treatment.

Untreated cases of secondary syphilis almost invariably give inhibition of hæmolysis in the tube with the 1 to 640 dilution. This quantitative technique seems more practical than that of Noguchi with varying amounts of the syphilitic sera.

Where inhibition is noted in the 1 to 160 antigen dilution the Noguchi test shows a very strongly positive reaction. In some cases where the Noguchi test is negative, but where there is a history of syphilis and prolonged treatment, the Emery test may show inhibition in the 1 to 20 dilution. Inhibition with this dilution has not, however, been obtained in any case where there was not a history to justify it. In order to be conservative, however, I have invariably reported such cases as negative to Noguchi, but from the result with the Emery to be considered as suspicious of syphilis. Sera showing inhibition in 1 to 40 have invariably given positive Noguchi reactions.

Where sera of one or more days standing have been sent in with a more or less negative complement content, or where it has seemed advisable to inactivate a serum to be tested, the lack of complement has been replaced by fresh guinea-pig complement of 40 per cent strength, instead of with normal human serum, as recommended by Emery.

Owing to technical difficulties with the method of making and employing the antigen and amboceptor features of the original Emery test, I have retained the principle of the test but substituted the reagents prepared in exact accordance with Noguchi's directions.

Briefly stated, the principle of Emery's test consists in the employment of fresh human serum for supplying complement and the primary incubating of the hemolytic system (human red cells and rabbit serum immune to human red cells) at the same time as the incubation of the antigen and serum but in separate tubes. Then in the second period of incubation to add these "sensitized" cells to the serum antigen combination.

In Noguchi's method all reagents are incubated together in the first period with the exception of the amboceptor paper (dried serum of rabbit immune to human red cells), which is not added until the period of incubation for complement binding is completed and the second incubation commenced. Time is saved in the Emery technique, inasmuch as the red cells are already sensitized by the hemolytic amboceptor when added to the tubes, and hemolysis shows itself almost immediately in tubes when the complement has not been absorbed by the antigen through syphilitic antibodies.

Noguchi has called attention to the fact that protein constituents of certain aqueous or alcoholic extracts may have the power to fix complement through certain intermediaries existing in fresh serum which, however, does not obtain for inactivated sera (sera heated to 56° C. for 15 minutes).

Pure lipoidal substances as contained in Noguchi's acetone, insoluble antigen, however, do not act in this way.

Consequently by using such an antigen we eliminate the objection to employing fresh human serum in the test for syphilitic antibodies.

As giving more uniform, hemolytic results and as being more stable and easier of employment, I have made use of Noguchi's directions for taking up the serum of the rabbits, immunized to human red cells and his method of standardizing this "amboceptor" paper. In practice, I measure off the length of paper corresponding to 8 to 10 Noguchi units and dissolve the dried serum in such paper in 1 c. c. of salt solution. This makes a satisfactory and uniform substitute for the sterile immune serum used by Emery. It has been noted that the dried rabbit serum on the paper may contain a certain amount of complement even when several months old, consequently, to avoid confusion, I invariably inactivate this serum paper solution by heating to 56° C. for 10 minutes.

At this point I may state that with an experience of many hundred tests I have only in one instance found a serum which did not contain sufficient complement to answer the requirements of the test. Incidentally, I may here note that we have in this technique a very satisfactory way of quickly estimating complement content in human serum.

TECHNIQUE OF EMERY'S MODIFIED WASSERMANN.

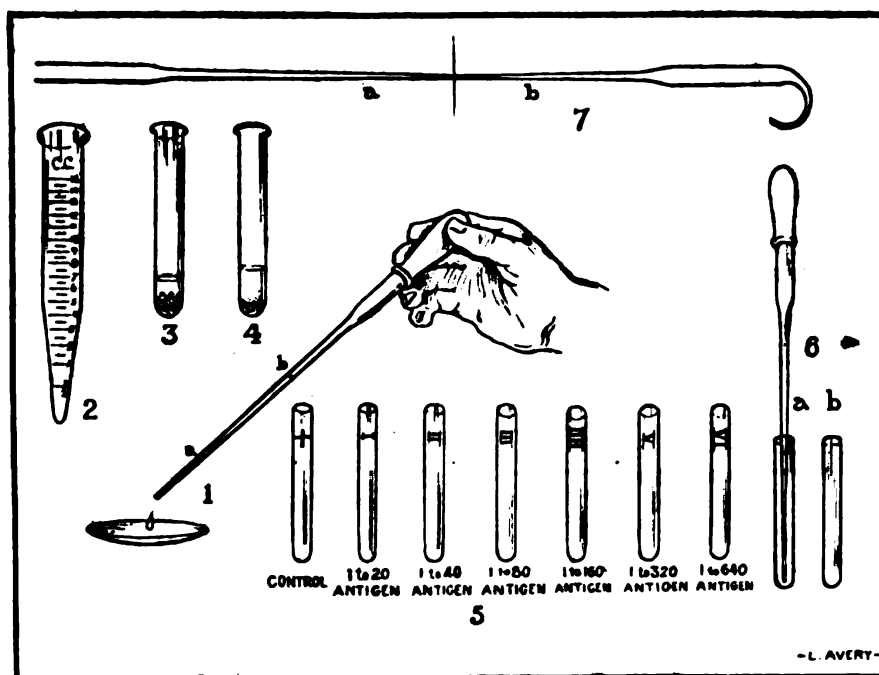
1. Take blood from the finger or ear in a large Wright U tube ($\frac{1}{4}$ inch in diameter). Place in 37° C. incubator for 15 minutes (to increase yield of serum) and then centrifuge.
2. Graduate a capillary pipette for 1 volume and 4 volumes.
3. Into each of a series of small test tubes put 4 volumes of normal salt solution. (These tubes are most conveniently made by breaking

off $2\frac{1}{2}$ to 3 inch lengths of $\frac{1}{4}$ -inch soft glass tubing and then fusing one end in the flame to make a small test tube).

Make a distinguishing mark, e. g., X, on end of tube with blue-wax pencil and use this tube to hold control. Mark the other tubes I, II, III, and so on. When different sera are to be tested they may be distinguished by lines either above or below, or with circles, also marks with red-wax pencil may be used.

4. Make a 1 to 10 dilution of stock antigen solution in salt solution.

To Tube I add 4 volumes of 1 to 10 antigen, thus making 8 volumes of 1 to 20 antigen in Tube I. Mix thoroughly by manipulating bulb



1. Capillary pipette being graduated by drawing up 1 and 4 drops from a watch glass. (a) Blue pencil mark of 1 drop or 1 volume. (b) Mark of volume of 4 drops.
2. Graduated centrifuge tube containing sodium citrate normal salt solution.
3. Tube with 10 amboceptor units in 1 c. c. of salt solution.
4. Mixture of 1 volume 50% emulsion red cells and 4 volumes inactivated amboceptor solution.
5. Small glass tubes for Emery test.
6. Method of transferring from tube to tube.
7. Making a Wright U tube—the end "a" to be used as a capillary pipette.

of pipette. Then transfer 4 volumes of the 1 to 20 from Tube I to Tube II, and so on through the series. When the dilution in the last tube has been made throw 4 volumes away.

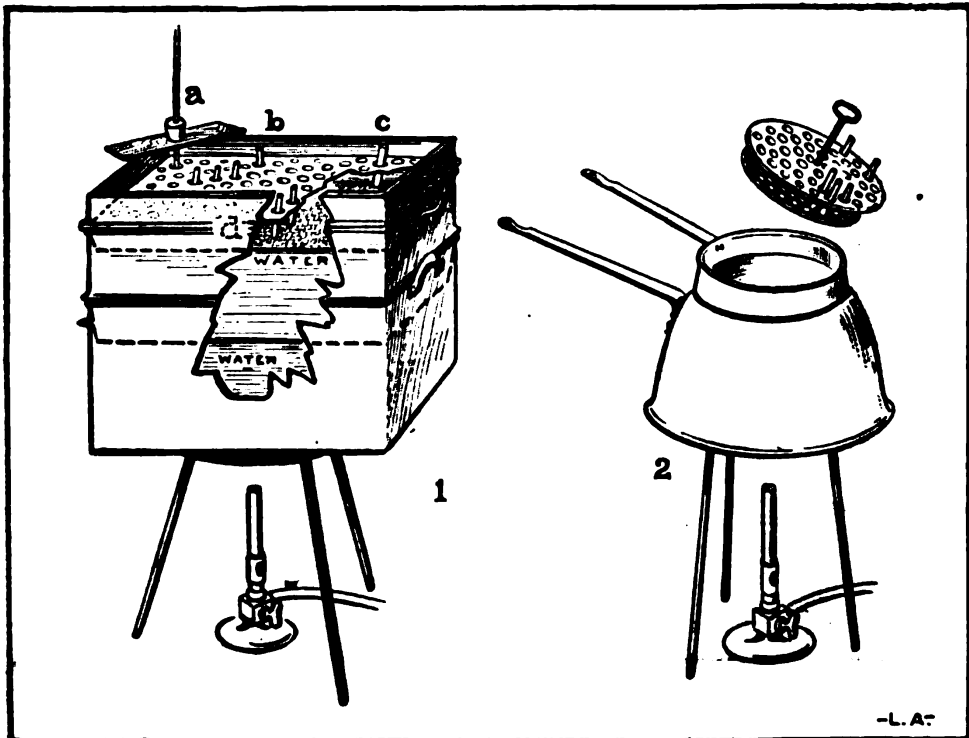
The 4 volumes of dilution of the antigen in the respective tubes will then be: In Tube I, 1 to 20; in Tube II, 1 to 40; in III, 1 to 80; in IV, 1 to 160, and so on.

5. Add 1 volume of serum to be tested to control tube X, and to each of the tubes I, II, III, etc., in succession. (If the serum be added to the antigen tubes before the control tube, antigen might be carried over to the control.)

6. If the serum has been inactivated restore complement by adding 1 volume of a 40 per cent fresh guinea-pig serum. Also use 2 volumes of this inactivated human serum instead of 1.

7. Incubate at 38° C. for 30 minutes. This allows syphilitic antibody, if present, to bind complement.

8. As soon as the above mixtures have been made and put in the incubator prepare the "hemolytic system" by adding 1 volume of 50 per cent emulsion of washed human red cells to 4 volumes of solution of amboceptor paper (8 to 10 Noguchi units of amboceptor paper dissolved in 1 c. c. of salt solution and then heated to 55° C. for 10



1. Copper water bath 12 x 12 x 8 inches. (a) Thermometer to show 38 deg. C. (b) Tubes containing antigen dilutions. (c) Tube containing *hemolytic system* incubating along with the antigen tubes.

2. Ordinary rice cooker with copper holder for test tubes.

minutes makes a suitable amboceptor solution—thus of a paper of which 4 mm. was the unit we should cut off about 40 mm., place in test tube and extract the dried serum with 1 c. c. of salt solution), and place this hemolytic system in incubator alongside the tubes already there. To obtain the washed, red cells allow 4 to 10 drops of blood to drop into a graduated centrifuge tube containing salt solution to which has been added 1 per cent of sodium citrate to prevent coagulation. After shaking, centrifuge. Pour off supernatant fluid, replace with salt solution, again shake and centrifuge—this sediment of red cells is to be diluted with an equal volume of salt solution (50 per cent

emulsion). (Incubation hastens sensitization of the red blood cells. Agglutination of red cells also occurs.)

9. At the expiration of 30 minutes from the commencement of incubation for complement binding, add 1 volume of hemolytic system to each of the tubes, I, II, III, etc., in the order of antigen dilution.

10. Finally, after washing pipette in salt solution, add 1 volume of hemolytic system to control in tube X. (If the hemolytic system should be added to the control tube before the antigen tubes, complement from the control tube might be carried over to the antigen tubes.)

Shake each tube thoroughly. Allow them to incubate for a few minutes. Then examine tubes I, II, III, etc., for hemolysis. The control should, of course, show hemolysis. The antigen tubes should show a white, supernatant fluid over the intact red cell sediment in the tubes with the low dilutions and even in the highest dilutions, where the serum is strongly positive. In a weakly positive serum, inhibition of hemolysis may only show in the first two tubes and hemolysis show in those tubes having higher dilutions of antigen.

It will be noted that the reagents are made in accordance with Noguchi's directions. Even in those cases where fresh guinea-pig serum is employed to replace complement, absent from the human serum tested, we employ the 40 per cent solution used in Noguchi's technique.

For those who may not have access to Noguchi's "Serum Diagnosis of Syphilis" the following abstract of his method of preparing antigen and amboceptor is given:

PREPARATION OF ACETONE INSOLUBLE ANTIGEN.

Take about 50 grammes of finely divided beef, dog, or rabbit heart or liver and triturate in a mortar to a paste. Pour on this paste 500 c. c. of absolute alcohol and keep the mixture in a corked bottle in the 37° C. incubator for 5 to 7 days. (We use beef heart and 96 per cent alcohol.) Next filter through paper and collect the filtrate in a large shallow dish and hasten evaporation with the aid of a current of air from an electric fan directed upon the uncovered surface.

Within 24 hours only a sticky residue should remain. This is taken up in about 50 c. c. of ether and the turbid ethereal solution kept over night in the refrigerator in a corked bottle.

In the morning there will be found about 45 c. c. of clear supernatant fluid which is decanted off and allowed to evaporate to about 15 c. c.

Now add about 150 c. c. of acetone and a precipitate will form which collects at the bottom of the measuring cylinder. Now pour off the supernatant acetone and let the sediment stand until it is of a resinous consistence. Now dissolve 0.3 grammes in 1 c. c. of ether and then add 9 c. c. of methyl alcohol. This gives the stock antigen solution.

In using the antigen solution for the Emery or Noguchi test we dilute 1 c. c. with 9 c. c. of salt solution. This opalescent, working, antigen emulsion should be made up fresh on the day of preparing the tests.

About one-half of these antigens are lacking in power to absorb complement in the presence of a syphilitic sera. More rarely they may absorb complement with a nonsyphilitic serum or they may have a hemolytic action. Consequently a new stock antigen should be tested as to its reliability—

1. A mixture of 0.4 c. c. working antigen emulsion, 0.6 c. c. salt solution, and 0.1 c. c. of a 10 per cent suspension of washed red cells when incubated at 37° C. for two hours should not show any hemolysis.

2. A mixture of 0.4 c. c. working antigen emulsion, 0.6 c. c. salt solution, 0.1 c. c. of a 40 per cent solution of fresh guinea-pig or normal human serum, and 2 units of amboceptor and incubated at 37° C. for 1 hour should show hemolysis when we now add 0.1 c. c. of a 10 per cent washed red cell emulsion and the whole then again incubated for 2 hours at 37° C. (The antigen did not absorb complement in the absence of syphilitic antibodies.)

3. A mixture of 0.2 c. c. of a 1 to 10 dilution of working antigen emulsion, 0.8 c. c. of salt solution, 1 drop of syphilitic serum, 0.1 c. c. of a 40 per cent dilution of fresh guinea-pig serum, and 2 units of amboceptor should be incubated at 37° C. for 1 hour. When we then add 0.1 c. c. of a 10 per cent suspension of washed red cells and again incubate for 2 hours we should fail to obtain hemolysis. (The antigen can absorb complement through the intermediation of syphilitic antibodies.)

PREPARATION OF AMBOCEPTOR PAPER.

In order to secure blood from the vein of a man or the heart of the immunized rabbit, the most convenient method is with the use of an Erlenmeyer flask with a rubber stopper having two perforations in the stopper. To one of the projecting pieces of glass tubing a stout hypodermic needle is attached through the medium of about 8 inches of rubber tubing, and the second piece of glass tubing is bent at an angle as it leaves the stopper to provide a suction tube. With a man, constrict the upper arm sufficiently to stop venous return with an Esmarck rubber bandage or a towel. Paint tincture of iodine over a prominent vein at the bend of the elbow. Gentle suction will cause the blood to flow into the needle tube and thence into the flask.

The blood as it is taken from the arm should be received in about 50 c. c. of normal salt solution containing 1 per cent of sodium citrate. About 28 to 30 c. c. is usually sufficient. Allow the citrated blood to stand over night in the refrigerator and the next morning decant off the supernatant fluid. Now replace this fluid with salt solution and pour the red cell emulsion into a number of tubes. The resulting sediment should be again washed and rewashed with salt solution as before. Two to three washings with salt solution suffices.

Now take a large healthy rabbit, shave the lower abdomen and paint the surface with tincture of iodine. The easiest way to inject the rabbit is to hold the animal head down and plunge the needle of a large glass hypodermic syringe containing the washed red cell sediment into the abdominal cavity in the median line. The intestines gravitate downward and by entering the needle below the limits of the bladder we avoid injuring any vital part.

Make the injections at intervals of five days and give increasing amounts at each successive injection. Thus, first injection, 5 c. c.; second injection, 8 c. c.; third injection, 10 c. c.; fourth injection 12 c. c., and at the fifth injection give about 15 to

20 c. c. of washed red-cell sediment. It is well to dilute the cell sediment with an equal amount of salt solution. About 10 days after the last injection, we take some blood in a Wright's tube from a vein of the ear and dilute the serum to make a 1 to 100 dilution. To 1 c. c. of a 1 per cent emulsion of red cells we add 0.1 c. c. of a 20 per cent dilution of guinea pig's fresh serum—similar combinations being made in a series of 10 tubes. To each of these tubes we add varying amounts of the 1 to 100 dilution, 0.1 c. c. in the first, 0.2 c. c. in the second, 0.3 c. c. in the third, and so on. If we obtain hemolysis in the tube containing 0.2 c. c. of 1 to 100 dilution of serum but not in that containing 0.1 c. c. we note that the serum has a titre of about 1 to 500. If the 0.1 c. c. gave hemolysis, the serum would have a titre of 1 to 1,000.

Having ascertained that the hemolytic serum is sufficiently strong we shave the left side of the thorax of the rabbit and enter the needle of the apparatus similar to that used for taking the blood from a man's vein in one of the intercostal spaces of the left side.

Having introduced the needle, feel for the heart beat and then plunge the needle into the heart. We can withdraw about 30 c. c. of blood without injury to the rabbit. This blood should be received in a clean empty flask and set, overnight, in the refrigerator. The following morning pour off the clear serum into a clean Petri dish and saturate, one by one, squares of filter paper with the serum. Allow the filter paper to dry on a piece of unbleached muslin. Noguchi recommends Schleich and Schull's paper No. 597. When thoroughly dry cut strips 10 mm. wide. This makes the amboceptor paper. To standardize, take a series of tubes containing 1 c. c. of a 1 per cent emulsion of red cells and add 0.1 c. c. of 20 per cent dilution of guinea pig serum for complement. Next cut across the amboceptor paper strip pieces of varying width as 1 mm., 2 mm., 3 mm., 5 mm., and so on. The narrowest strip which gives hemolysis equals one unit. Thus if a piece 5 mm. wide was required to produce hemolysis, 5 mm. of the paper would have a value of one unit.

SOME MINOR SANITARY DEFECTS IN MODERN BATTLESHIPS AND THEIR CORRECTION.¹

By Surgeon F. L. PLEADWELL, United States Navy.

We are all aware that, as occupants of a modern battleship, we are required to live under conditions having no exact resemblance to those of any other community. In the later ships the concentration of life below requires that all the usual sanitary rules be applied with extreme rigor, but military exigencies often run counter to the precepts and practice of hygiene, and in many situations it becomes impossible to achieve the standards of sanitary science in vogue ashore. Nevertheless a critical survey will reveal many deviations from commonly accepted sanitary standards the avoidance or correction of which involve no conflict with military necessities. It is chiefly of these deficiencies that I intend to speak.

ARCHITECTURAL DETAIL.

During the usual weekly sanitary inspections made the past year, in two comparatively recently built ships, I have been impressed with the fact that in many of the minor details of ship construction

¹ Prepared for the Conference of the Medical Officers of the United States Atlantic Fleet, Guantanamo Bay, Cuba, 1912.

there is often a failure to adhere to certain standards long since recognized ashore as being of decided sanitary value, such as are exemplified, for example, in avoiding unnecessary recesses and angles, moldings, ornamentations, etc., in furnishing the well-known sanitary cove base at the junction of the deck and bulkhead, and in providing space for cleaning behind fixed lockers. In this respect we are far below the standards of shore communities. It is of course realized that the structural elements used for ships at present may not lend themselves to the attainment of these standards, but until they do a great deal can be done in the desired direction with a bucket of cement and a trowel in obliterating the many dust-catching and dirt-concealing ledges and crevices to be seen in many places. The amount of labor expended in cleaning could then be greatly diminished, and what is saved here would go toward fulfilling the constantly increasing demands of the military side of ship life.

THE ABOLITION OF WOOD.¹

In the Report of Spring Battle Practice, 1911, attention was invited to the desirability of securing a further limitation of the remaining wooden articles and fittings aboard ship, such as lockers, shelving, tables, chairs, desks, wardrobes, bunks, drawers, bookcases, doors and door frames, ladders, and even decks, as well as meat tubs, water-closet seats, and possibly boats, mainly for military reasons but also on sanitary grounds, and their substitution in metal. In the later types we see this substitution achieved in many directions, but there are still many articles and utensils constructed of wood that should have no place in a modern man-of-war. Prominent among these and very important from the sanitary viewpoint are mess tables and benches, meat tubs, and lockers. It is no longer necessary to dwell upon the extremely insanitary spit kit so long in use in the navy, for there is now being issued a galvanized sheet-steel spitbox, intended to replace the present article. From the æsthetic point of view, especially to those who are fond of recalling former standards of cleanliness, nothing so appeals to the eye as the cleanly looking, well holly-stoned and sun-whitened wooden article of former days, but since wood has become very undesirable for military reasons, and the demands upon time and labor under modern conditions do not seem to permit of our reaching former standards, nothing is more difficult of attainment aboard ship nowadays than a sanitary condition and a presentable appearance of some of these wooden articles. This is particularly true of mess tables and benches. The unfilled grain of the wood tends to absorb grease and dirt and this blotting paper

¹ Since this was written the policy of "stripping" one or two ships yearly preliminary to target practice has been inaugurated, and doubtless this procedure will invite attention to the desirability of substituting metal for wood in many additional ships' fittings.

action is quickened by all the usual methods of cleaning which tend to open up the grain of the wood still more. Failing the bleaching action of the sun they soon present a dingy and unsightly appearance betokening an unsanitary condition. In the ships in which the writer has recently served a decided sanitary improvement in the condition of the articles named, as well as of water-closet seats, has been secured by the application of several coats of plain shellac. This procedure fills the grain of the wood, makes a hard, smooth, nonabsorbent surface which is readily cleaned and is withal pleasing to the eye. The provision of metal mess tables represents a most desirable aim in the naval service, but search is still being made for a suitable material. In the French service, a section in the sanitary regulations touching this subject reads as follows: "In future, wooden mess tables will be replaced by metallic tables, being noninflammable and easy to clean." I was assured by a French naval constructor last winter that such tables were projected for new ships but none were in service as yet. In that service they tended toward the adoption of some form of enameled iron, but the difficulties encountered in securing a durable enamel had delayed the adoption of this type of table.

MESS GEAR.

The present enameled mess gear, while satisfactory when new and unmarred, after very little usage at the hands of messmen presents an unsightly appearance from chipping off of enamel and an uneven surface difficult to clean.

However, it is particularly to the shape of certain articles of mess gear that I desire to invite attention. For instance the syrup jug. It is readily seen that special ingenuity is required to get at the inner surface of this utensil. To a less degree the coffee pot has a shape rendering cleaning difficult. The inner surface of the cover to the butter dish has a depression or concavity and this is inaccessible to any ordinary effort at cleaning. Complicated ridges and crevices at the top of the molasses jug hold rust and dirt and no ordinary dish-rag will effectually eradicate them.

Monel metal, an alloy of nickel, copper, iron, and manganese, is under investigation as a substitute for enameled iron, as is also another alloy the chief component of which is aluminum. These alloys are claimed to be noncorrosive and nonrusting and if they prove amenable to appropriate treatment necessary to form the desired shapes for mess utensils, we may see them eventually replace the present unsatisfactory enamel ware. For obvious reasons all mess gear and crockery should be subjected periodically to the disinfecting action of boiling water in the dish-washing machine.

MEAT TUBS.

The wooden meat tub still furnished some ships needs but little warm weather to make its presence known, chiefly through the sense of smell, and it rarely presents a wholesome appearance. The reason is not far to seek. In constant use to hold meat and other articles of food, the wooden surface soon absorbs the juices that make prime culture media for putrefactive bacteria, which are free to exert their influence under appropriate conditions of warmth and moisture, ever present in the galley. The only circumstance that saves the service, in such premises, from occasional meat poisoning, is the practice of promptly cooking meat after removal from cold storage. Should it remain over long in the meat tub contamination would occur and putrefactive changes follow.

Some years ago the Bureau of Construction and Repair took up the subject of procuring a metal meat tub of a type to meet the objections above mentioned, but with what success I am unable to state.¹

LADDERS.²

One type of ladder in use in ships, namely, that with steps or treads of open lattice work, is very objectionable from a sanitary point of view, in that dirt collects in the interstices and resists ordinary efforts of removal. This dirt is usually shaken out by lifting the foot of the ladder and allowing the whole structure to fall heavily to the deck, a procedure extremely objectionable, apart from the noise it creates, since it distributes dust and dirt throughout the compartment.

A number of ladders of this description have been converted into a more acceptable type by reversing the treads and bolting linoleum into them. This makes a solid tread and assures a good foothold.

DECK COVERINGS.

The custom of using canvas as a deck covering in various places on the gun deck, while labor-saving and protective to the linoleum, is insanitary, especially if the effort is made to fix it permanently in place, for it is with difficulty laid so that dirt will not slip under the edge, and with moisture supplied from swabs, there is then formed a nidus of bacterial activity that is very likely to produce disease. For similar reasons it is believed to be advisable to limit the use of rugs and unwashable hangings and curtains aboard ship. Especially in ships of the dreadnought type, where officers' quarters are forward, and invaded more or less continuously by men from all

¹ I have since learned that such a metal tub is being issued to the service.

² It is understood that the type of ladder here criticized is not to be placed in ships in future.

parts of the ship, even from the engine room and fire rooms, the rugs in the wardroom country soon become filled with dust and dirt, which is only inadequately removed by a carpet sweeper. Frequent observation has demonstrated that upon any sweeping process objectionable dust is disseminated throughout the compartment and of course breathed in by its occupants. A rug collects and harbors dirt and gives it out upon disturbance, while upon the smooth hard surface of linoleum dust is easily seen and removed. If rugs have any place aboard a modern man-of-war, which I doubt, their use in situations where traffic is frequent and general should be strictly limited to dress occasions. Their æsthetic value is admitted, but this should not weigh against the objections above mentioned.

CORK PAINT.

Cork paint appears on many surfaces in the modern ship where apparently there is little reason for its use. As it presents a dust-catching surface, it is desirable to restrict its use to such areas as would be likely to condense moisture under certain atmospheric conditions. There seems no reason, for instance, for placing cork paint on a turret casemate at the level of the superstructure deck, where there is very little likelihood of condensation occurring.

CLEANING SHIP AND DECK SWABS.

The problem of cleaning ship below decks resolves itself largely into the adequate disposal of dust, both wet and dry. The dust of ordinary attrition and wear, coal dust, the dust of human débris, dried sputum, and food from the mess tables constitute different varieties. Dust in the ship's living spaces constitutes an even greater menace to health than in communities ashore, owing to the concentration of people in a ship and the great difficulty that exists of limiting the influence of infectious dust, such as may arise from tubercular sputum and other infectious material. I feel convinced that ships will eventually be piped for vacuum cleaning with outlets into each compartment, and in this way overcome the objectionable methods of cleaning now in vogue, which depend for efficiency upon the copious flushing effect of water (often salt water, which leaves a hygroscopic residue), combined with the use of deck swabs. The vacuum apparatus is equally effective in disposing of dirty water. The average deck swab is calculated to leave more dirt than it removes, and this film of dirt is often of a most offensive nature, doubtless usually a well-concentrated mixture of fermentative bacteria. The adequate care of ship's swabs should comprehend their absolute disinfection at stated periods by boiling lye water and drying out in the sun on deck, otherwise they are a menace to health. It would

represent a decided advance if we could procure and serve out periodically for cleaning purposes enough inexpensive material of the nature of ordinary cheesecloth, to be thrown away or laundered after a certain use.

SPEAKING TUBES AND TELEPHONE RECEIVERS.

It has long been known, from actual experiment, that a projection into surrounding space of minute particles of saliva occurs in talking or coughing. Should a person using a speaking tube have tuberculosis, diphtheria, tonsillitis, mumps, syphilis, an ordinary cold, or any other mouth-borne disease, it is apparent that the dried-out particles of saliva and its content of germs, when disturbed by a subsequent user of the instrument, may readily be inspired and disease result. The mouthpieces of public telephones and speaking tubes should be constructed to permit of ready cleansing and disinfection, preferably by lining them with some sort of enamel finish.

OFFICERS' QUARTERS FORWARD.

Further experience does not lend support to the view that there are other advantages than assumed military ones accruing, either in comfort, convenience, or sanitation, from the arrangement of officers' quarters forward in the recent types of ships. The following objections have been noted:

1. Wasteful of space from unnecessary duplication of accessory spaces.
2. Wide separation of junior and senior officers.
3. Noise and traffic in and about officers' quarters.
4. No sufficient upper deck or superstructure spaces for crew in bad weather.
5. Subversive of discipline of crew.

Furthermore, during the extremely bad weather of the recent trip from New York to Guantanamo (January, 1912), when it was necessary to close all main-deck hatches, it developed that there was no escape for the crew from the lower-deck spaces, nor opportunity to get to the main-deck to dispose of garbage, etc., except through the hatch which traverses the wardroom country and the quarters adjacent to those of the commanding officer on the level of the boat deck. This is a narrow and circuitous route of emergence, and when used in this manner results in a very disagreeable condition of affairs in officers' quarters, not to mention the danger to the crew should quick escape from the lower decks be necessary. There are two hatches opening under the boat deck in this type of ship that could be made available in bad weather should this deck be inclosed laterally by bulkheads, extending this deck further aft if necessary.

The ventilation of this part of the ship under adverse weather conditions preventing use of air ports, and also during the drill of "darken ship," is extremely defective and the air here soon becomes foul. With ports closed no means of renewal are then available, for here there is no adequate artificial supply. It is realized what difficulties stand in the way of securing a constant supply of pure air in a modern warship, but successful ventilation comprehends certain requirements that are often enunciated but seldom uniformly adopted in our ships. They are (1) the complete and sufficient changing of air without creating disagreeable drafts; (2) in the event of natural ventilation failing (the instance in point) there must be a system of artificial ventilation at least equal to the natural; (3) in every case of supply or exhaust there must be provision for a corresponding outlet or inlet; (4) if the air is heated it must be supplied with moisture; (5) the openings of all air trunks, whether connected with the supply or exhaust systems, should be placed in the superstructure so as to enable them to be used at sea in all weathers.

In closing, it will be of interest to note that the English service whom we followed in adopting the forward position of officers' quarters have reverted to the former arrangement and I understand we shall do the same in the latest types.

THE SANITARY BARBER SHOP.

The Navy was a pioneer in the sanitary advance represented by the device which eliminated the common drinking cup, against which public opinion ashore in many localities has only recently been effectually aroused. In some other directions respecting sanitation the Navy lags rather behind the times. This is particularly true of its barber shops. The modern ship should have an up-to-date barber shop and it seems only right that the officers and enlisted men should be given the advantages of cleanliness, comfort, and protection from disease aboard ship that they would reasonably expect to find in the average community ashore. A ship's original allowance list should include such articles and fittings as will enable the barber to carry on his work in a cleanly and sanitary manner. I have carefully scrutinized the municipal ordinances of several of the larger cities touching this matter, and find that a ship's barber should have the following requisites in order to comply with the average sanitary requirements: (1) A washstand with hot and cold water for washing the hands and brushes, and for shampooing; (2) electric stoves or equivalent fixtures for furnishing boiling water; (3) a small formalin chamber for disinfecting brushes; (4) adequate light and air; (5) the usual fittings, such as chairs, cabinet, etc., of a standard design.

The provision of the equipment above mentioned would represent a very small additional expense if included in the original outfit of a

ship, and since it is necessary to have a barber shop in all the larger ships it seems most desirable that space should be assigned for such a purpose in the original plans and provision made for the fittings and accessories mentioned. The ship's barber will then be able to carry on his work in a cleanly and sanitary manner and without menace to the health of the crew.

BATHING FACILITIES FOR THE ENLISTED MEN.

The attainment of that degree of cleanliness both of clothing and person that may be considered essential to health, particularly health of the skin, without undue expenditure of fresh water, still remains a problem in our ships. Distinct advance has been made, however, in recent years in allowing a more liberal distribution of fresh water, and by so doing minimizing the very offensive practice of washing from a common pail and of hoarding water and subsequently using it to wash paint work. It would also seem to be a matter of no little importance in its bearing on health to afford adequate facilities to enable men to wash their hands before meals and particularly after leaving the "head." Nothing adequate to the fulfillment of these simple rules of hygiene is as yet available. A discussion of the various schemes proposed would lead me beyond the limits of this paper. It is worthy of full study and its real elucidation would mean a most decided sanitary advance.

WATER-CLOSETS.

The forward location of water-closets necessitated by the forward position of officers' quarters in recent ships has served to accentuate a very disagreeable characteristic of the type of water-closet apparatus supplied. This characteristic is one due to the compression of the column of air in the discharge pipe consequent upon pitching of the ship, with inadequate means of relief of this pressure. The very disagreeable experience of having the contents of the bowl projected upward is not unusual at sea in certain weather. Furthermore, the water-closet bowl in itself is objectionable from its small size, which hardly permits of use without soiling of or contact of the person with its inner surface. The transmission of disease in this manner is entirely possible.

DRYING ROOMS.

Inclosed spaces about the funnel uptakes in which clothing damp from exposure in wet weather may be dried out would secure a freedom from certain illnesses among enlisted men and hence loss of service that becomes too evident when the ship's company and boat's crews are exposed to the inclement weather characteristic of the

winter cruising in northern latitudes in recent years. Such conveniences are a regular feature of ships of other services and should be extended to ours.

CONCLUSION.

In conclusion I may state that while few of the sanitary defects I have here mentioned taken by themselves exert much damage, the combined result of their correction would operate materially to improve physical efficiency in the personnel. It must be borne in mind that in the effort to maintain the physical, mental, and moral stamina of the personnel at a high level we are entitled to have extended to us all the modern facilities found valuable elsewhere, so long as their adoption will not conflict with the military exigencies for which the Navy rightfully exists.

ADDITIONAL REPORT OF CASES WITH UNUSUAL SYMPTOMS CAUSED BY CONTACT WITH SOME UNKNOWN VARIETY OF JELLYFISH.¹

By Passed Assistant Surgeon EDWARD H. H. OLD, United States Navy.

Preliminary to the report to be read on the two cases seen last spring while at Guantanamo Bay I would like to read some extracts from a paper on this subject which was read in February, 1908, before the Philippine Islands Medical Association and printed in the Philippine Journal of Science for September, 1908. The cases reported were observed during the summer months of 1906 and 1907, while I was on duty at the United States Naval Hospital, Canacao, P. I.

The first case was seen in 1906 and the account which the patient gave of his symptoms after having been stung by a jellyfish seemed so exaggerated that it was not seriously considered at the time and his actions and complaints were looked upon merely as a marked hysterical attack following an ordinary sting from one of these fish. Not until other cases were observed in 1907, were such symptoms, following the sting of a jellyfish, looked upon as possibly something peculiar to those waters.

Notes were made on cases as they were observed. These notes showed a regular symptom complex, and some cases (four), noted by medical officers stationed at Cavite and Olongapo, go to prove that the symptoms were not accidental.

Case 1.—In August, 1906, a call was received at the hospital stating that a man, who had been in swimming off Sangley Point, had been stung by a jellyfish and was very sick. A friend, who was with him at the time, said that the patient, when he came out of the water shortly after he had been stung, complained of pain over his thigh and soon afterwards of pain elsewhere; then he became prostrated and began to vomit, cough, and breathe rapidly. On admission to the hospital an area of erythema, slightly raised and about the size of the palm of the hand, was seen on his right thigh; vomiting had ceased but his respirations were much increased and he continued to cough almost incessantly. The cough was short and hacking in character, as if a foreign body had lodged in the larynx, and a thin mucoid sputum was expectorated.

¹ Read at the Conference of the Medical Officers of the United States Atlantic Fleet at Guantanamo Bay, Cuba, February, 1912.

torated. His face was congested and anxious in expression and he wept at intervals. He threw himself constantly about on the bed, seemed to be in great pain and expressed much anxiety as to his condition. As stated above, his actions were looked upon as hysterical, for this was the first case of this nature seen there. He was given morphine sulphate by hypodermic and an alkaline solution applied locally; was relieved in about half an hour. The next day he felt a little weak, but reported for duty.

Case 2.—V —, a hospital apprentice at Canacao, in June, 1907, while in bathing off the hospital wharf, was stung by a jellyfish. He said that he was some distance from the landing and, as soon as he felt the sting, he turned back to the wharf; that on his way he felt some pain across his back, but thought it was due to swimming. On his way up to the hospital he began to feel badly and sat down for a little while. When he reached the hospital, about 30 minutes after he had been stung, he became prostrated and had to be carried to bed.

On arrival I found a slightly raised, vesiculated, red area over the left biceps muscle. This "wept" like an eczema. The patient was throwing himself around the bed and coughing almost incessantly, expectorating a thin mucus. He complained of nausea but did not vomit. His face was congested and anxious. He wept at intervals, a stream of tears flowing down his face. His nose was occluded as in a bad case of coryza and from it a thin mucus was discharging. He complained of pain in his head and of marked pain in the lumbar region. He expressed much anxiety as to his condition and exclaimed now and then "I don't know why, but I've lost all my nerve." His temperature was 100.2° F.; pulse 100, strong and full. Examination of blood and urine showed nothing abnormal. Treatment mentioned under Case 1 relieved him.

In that report there were six other cases quoted, all of whom had symptoms like those mentioned, though some were in less degree. One case with a fatal termination was reported to me by Surgeon C. P. Kindleberger, United States Navy, at that time stationed at Olongapo, P. I. In that report it was mentioned as—

Case 8.—The patient was a Filipino boy, 14 years old, who was seen on July 16, 1907. He was stung on the right forearm by a jellyfish; a red welt was seen over the affected area. He cried with pain, was restless and became partially unconscious. The lesion was treated locally with application of alcohol, and internally with a solution of sodium bicarbonate with bromides; he became quiet and was apparently in good condition. His father insisted on taking him home and as soon as the patient saw the water he again became hysterical. Shortly after he reached home a call was received for some one to see him, to which a hospital steward responded; he reported that the boy's heart and respiration showed signs of failure and that he gave stimulants both by mouth and hypodermic injection, but these had no effect and the boy died at 7.30 p. m., just three and a half hours after he was stung.

The symptoms, as noted, appeared in from 10 minutes to an hour, but usually in from 10 to 15 minutes. In the nine cases quoted one death occurred (Case 8), that of a Filipino boy. Four cases, one of whom was a Filipino, had the marked hysterical symptoms with the increased cough, restlessness, pain, nausea, etc., and all presented about the same picture.

I have been stung many times by the jellyfish found abundantly in the waters of Chesapeake Bay, Virginia, called there "stinging nettles" and "blood suckers," but beyond the local erythema and pain no other symptoms were noticed. From this experience, and considering the suffering of some of these cases, I can not but believe that there is some absorbable substance present in the secretion of the fish concerned. The irritation of the mucous membrane of the mouth, throat, nose, and eyes, as seen

in some cases and not in others, may be explained by the fact that some of the tendrils, or water around the fish which contained the cell secretion, came into contact with these areas; and this might also explain the nausea and vomiting, but the severe general body pain suggests the possibility of an absorbable substance, as does also the case of death in which a depressing effect was noted.

The part which such a cause might play in drowning is also of interest aside from that of diagnosis. A person when stung generally strikes out for shore or a boat, but should he be very far from either, and symptoms of the severe type come on while he is still beyond his depth, I doubt if he would be able to reach land safely.

The particular variety of jellyfish that causes these symptoms is so far unknown to me. Inquiries were made among the fishermen along the shore near the hospital concerning the nature of this fish, but, although they disagreed as to which variety caused the sting, they agreed that there was one which made a man sick when he was stung, and mentioned vomiting as one of the symptoms. Some said it was the red variety, which is the more common in the water thereabouts through the summer months; while others said the white variety was the factor. Several attempts were made by men at the hospital to produce these symptoms artificially by rubbing the fish, both red and white, on their arms and legs, but with no result. I do not believe that the symptoms are produced by the common varieties, but from one less frequently seen. Some of the patients said they were stung by the red fish, others by the white, but none of them waited to capture their tormentor.

It was when the Fifth Division and several other ships were at Guantanamo Bay last spring (May, 1911) that the two cases noted below were observed, and as their symptoms resembled so closely those seen in the Philippines in 1906 and 1907, they are believed to be worthy of reporting to this session, for we are liable to have such cases when in these waters, and when seen for the first time I believe the recognition of such a symptom complex will be of assistance and not lead you to think the patient an hysterical, nerveless man as I did when I first saw one suffering in the manner described.

We were at Guantanamo from March to June, and during that period both officers and crew were accustomed to swim over the side every day. The stinging nettles increased greatly in numbers during the latter part of this period, and several swimmers were stung, having only the local erythema and pain to follow, but two on the U. S. S. *North Carolina* had the general symptom complex.

Case 1.—W. J. C.—Sea. Patient was seen shortly after he went to the sick bay. He had been stung on the arm, chest, and neck, while just off the end of the forward lower boom. He swam immediately to the sea ladder and said he felt so badly he could hardly get up to the forecastle. As soon as he reached the deck he began vomiting, and, when seen, he complained of marked weakness, general body pains, but especially across the posterior lumbar region, nausea and irritation of the respiratory tract. He was coughing and expectorating mucoid sputum. His eyes were injected and watery; he was very restless and the erythema was present over arm, chest, and neck. He was given morphine sulphate by hypodermic and an alkaline solution applied to area of erythema. The next morning he felt all right and returned to duty.

Case 2.—H. M. A., chief boatswain. This patient was not seen until some time after he was stung, as he did not notify a medical officer. The arm and the region of the mouth were the areas affected. He went immediately to his room and on his

arrival there became nauseated and vomited. Said he felt "all in." Complained of general body pains and especially across the posterior lumbar region, also of a burning sensation in the mouth. When seen he was coughing, sneezing, blowing his nose, and expectorating almost incessantly. He was walking around aimlessly and complained of marked dizziness; said he felt drunk. His eyes were injected and watery, face red. One of his mess mates came to me and said this patient was acting as if he were insane; they could not understand him at all and were actually afraid of him. He did not wish to take morphine, so was given codeine in gr. 1 doses. Symptoms had subsided by morning except pain in his arm and a feeling of weakness and depression.

After the first case, I requested some of the other medical officers on the ships then present to look out for such cases, and two or three of them later told me they had also had some like those described.

As remarked in the article read previous to this paper it is my belief that if a man was some distance from the ship when such symptoms appeared that he would be very likely to drown if assistance could not readily be extended him; and, as this danger is the one to be especially avoided by foresight on our part, I recommended that the following notice be posted on the bulletin board as a warning to the crew:

On account of the fact that occasionally one is made very sick after being stung by a stinging nettle, any man so stung if any distance from the ship at the time, shall immediately make for the ship so as to be where assistance could be given him if he became in need of same.

In addition to this the executive officer gave notice that no man was to swim out beyond the dinghey on duty.

The cases observed in the Philippines and those enumerated herein, all occurred in the late spring, but I do not know whether such are likely to happen at that time of the year only or not, and if any one present has a case occur, while we are here, during the winter months, I would be very glad to hear about it.

THE EFFECTS OF HIGH TEMPERATURE ON THE PERSONNEL OF THE FIRE ROOMS OF NAVAL VESSELS, WITH SPECIAL REFERENCE TO HEAT CRAMPS (MYALGIA THERMICA).

By Passed Asst. Surg. W. L. MANN, United States Navy.

These observations are based principally on two series of cases occurring on board the U. S. S. *Tennessee* while making an extended cruise under forced draft. About 40 cases were observed on the 18-knot cruise from San Francisco to Honolulu, September 5-10, 1910. On the trip, with the President on board, from Charleston, S. C., to Colon, Panama, November 10-14, 1910, 41 cases were recorded. The following statistics are compiled from the latter group. If the milder cases, which failed to report at the sick bay, and cases that,

due to exigencies of the circumstances were not recorded, are included, about 10 more cases should be added to the above figures. In addition there has been about 15 miscellaneous cases observed in the past two years, making a conservative total of over 100.

The nomenclature of the effects of high temperature on man is somewhat confusing. Until our meager knowledge regarding the etiology is further enlightened, I suggest the following symptomatic classification: (1) *Febris thermica*: This includes (a) a state of pyrexia, probably caused by the actinic rays of the sun, an indefinite and comprehensive group (as "sun traumatism,"¹² "phrenitis,"⁴ and "cerebrospinal¹³ type"), and (b) a state of hyperpyrexia, probably due to an infection, known by the recently revived name of "siriasis."^{11 12} (2) *Prostratio thermica*: This is a state of exhaustion associated with deficient thermolysis, either intrinsic or extrinsic in origin, as impaired health, humidity, and the lack of drafts; this condition is essentially a syncope, with nothing characteristic to differentiate it from other syncopes, and scarcely merits the name. (3) *Myalgia thermica*: This is a condition of myalgia, probably of microbic causation, and closely related to siriasis. About 80 per cent of the cases observed could be classified as *myalgia thermica*, 10 to 15 per cent as *prostratio thermica*, and 5 to 10 per cent simulate a combination of these. Many cases of hyperpyrexia among firemen have been reported, but as no cases have been observed aboard this ship the following discussion will not include this class.

ETIOLOGY.

Prostratio thermica.—The majority of cases gave a history of some predisposing cause, as errors in diet, torpid liver, alcoholic and other excesses. The exciting cause was the high temperature with concomitant conditions that impaired heat dissipation, as high relative humidity and the absence of appreciable drafts. These cases occurred in the engine room, coal bunkers, and above the blowers but never among those working under the blowers, although the temperature was higher here than in the engine room.

Myalgia thermica.—A history of a previous attack was the only predisposing cause discoverable; in 25 cases 20 per cent gave the history of a former attack. Elliott finds the colored race to be more susceptible. Meyer states that some persons seem exempt, but if they have one attack they will likely have others. It attacks men irrespective of their general physique. A large, able-bodied man may suddenly drop with flexors of the body and the extremities firmly contracted, while his anæmic and apparently weaker companion may suffer no symptoms during the trip. The lack of fire-room experience was noticed as a predisposing cause in the first series, but in the second the reverse was true. On the Colon trip over one-half the cases

among men of the first enlistment occurred in the experienced men (assuming two years to be the average experience). Only one case was recorded among 105 of the deck force volunteering for duty in the fire room (this was a questionable case claiming to have muscular cramps after being on watch only 20 minutes).

The epidemic nature of heat cramps early suggested the presence of an undetermined pathogenic factor. It tended to affect certain watches and messes more than the others combined. This was at first attributed to coincidence until 105 inexperienced men, from the deck force, showed a morbidity of less than 1 per cent, while the inured engineer force presented a morbidity of more than 16 per cent. The assumption of an infectious agent, among men closely associated, with an incubation period of several days, might explain the apparent immunity of the deck force and the high percentage among firemen. The presence of this unknown factor was first noticed by Meyer, who found that nearly all his cases happened on outbound trips from New York, and that the increase in the number of cases varied but slightly with an elevation of temperature, being almost as prevalent in winter as in summer. He attributes this appearance of heat cramps to a pathogenic element in the American food. Later, Grunwell,²⁹ reasoning from theoretical yet probable premises, has suggested the tetanus bacillus as a possible pathogenic agent.

Meteorological conditions of the fireroom in forced drafts.—A brief description of the fireroom is necessary to emphasize certain important points. The firerooms of the U. S. S. *Tennessee* consist of eight symmetrically arranged compartments with forced draft on the "closed fireroom system." Each compartment is capable of being converted into an air-tight space. The air is forced in by fans 5 feet in diameter making 500 revolutions per minute, raising the inside atmospheric pressure about 1 to 2 inches (water manometer), and by this compression of the air the temperature is slightly elevated (5° for every inch of pressure). Three times the usual amount of coal is consumed in forced draft, necessitating nearly treble the amount of work for the firemen. The stokers stand directly under the blowers, with air of 116° to 140° F. and 8 to 50 per cent R. H., and velocity of 3,000 to 4,000 feet per minute blowing over their sweating bodies. Every one to three minutes they open the furnace doors and expose themselves, for a few seconds while stoking, to a temperature of 166° to 179° F., and then again assume a position of rest under the blowers. This muscular labor and change of temperature every few minutes causes free perspiration, which is rapidly evaporated by the powerful blast of hot, dry air, thus producing an extremely artificial condition seldom simulated by nature. Notwithstanding this high temperature it is by no means unpleasant under the blowers, as thermolysis seems equally increased as thermogenesis, hence causing thermotaxis to remain normal.

But above the blowers we have a different meteorological condition; this has been termed the area of "superheated air." The warm air rises, accumulates there, and can find no exit, thereby causing an air temperature of 170° to 195° F. with no appreciable drafts to ameliorate the heat. Oilers and others worked there 10 to 15 minutes at a time. The temperature was so high that, in repairing one of the blowers, it was necessary to keep the implements in cold water to permit use by bare hands. To furnish a further concrete example of this high temperature it may be mentioned that eggs placed in water were coagulated to a semisolid consistency by the heat of the surrounding air where men were working. Similar conditions of high temperature, with absence of perceptible drafts to aid heat dissipation, existed in the coal bunkers.

Date.	Engine-room temperature from log.	Fireroom temperature from log.	Average hourly deck temperature.	Coal consumed, in tons.	Maximum hourly R. H. on deck.	Minimum hourly R. H. on deck.	Average hourly R. H. on deck.	R. H. in fireroom. ¹	Number of recorded cases.
Nov. 10, 1911, 12 m. to 12 p. m.	°F. 104	°F. 120	°F. 65		Per cent. 84	Per cent. 72	Per cent. 75	20 to 8	1
Nov. 11, 1911.	108	115	76	275	87	75	76	28 to 12	11
Nov. 12, 1911.	112	135	80	262	91	74	85	40 to 16	18
Nov. 13, 1911. ²	108	125	81	223	87	73	80	37 to 15	9
Nov. 14, 1911, midnight until 10 a. m.	112	139	79		96	83	85	36 to 14	2

¹ Approximately calculated from the average hourly relative humidity of air on deck at the average hourly temperature when heated to fireroom temperature; the fireroom temperature assumed to be 115-185° F.

² The forced draft discontinued.

Temperatures of the individual firerooms (about average).

Starboard.				Port.			
Fireroom No.—	Passage-way.	Between boilers.	Above blowers.	Fireroom No.—	Passage-way.	Between boilers.	Above blowers.
	°F.	°F.	°F.		°F.	°F.	°F.
1.....	120	132	186	2.....	119	130	185
3.....	115	128	183	4.....	116	131	181
5.....	118	129	180	6.....	120	134	183
7.....	108	122	169	8.....	122	136	186

A study of the above conditions may explain prevalence of myospasms aboard ship in winter as well as in summer, in torrid as well as in temperate climates. The temperatures of the firerooms under forced draft seem but slightly influenced, relatively speaking, by the temperature of outside air, yet on an average winter day the air of the fireroom is much dryer than on an average summer day, and this dryness of the air increasing the evaporation of perspiration appears to be one of the essential factors in the production of heat cramps.

The following example better illustrates the extreme dryness of the fireroom on a cold day. If saturated air at 88° F. is heated to a fireroom temperature of 138° F., it would have a R. H. of only about 70 per cent, whereas saturated air on a winter day at 32° F. if heated to the same temperature would present a R. H. of less than 9 per cent. No satisfactory tables for temperatures over 100° F. were obtainable. Hence these figures are only approximately estimated. The contrast should really be more striking.

SYMPTOMS.

Milder cases of heat cramps, especially when unilateral, presented a sthenic condition, probably due to the stimulating action of the mild pain. In the severer cases the system seemed overwhelmed, but even then the asthenia was not conspicuous. Many of the patients when recovering complained of a "throbbing temporal or supraorbital headache, rarely occipital."² The pupils were generally normal, but may be contracted or dilated. The conjunctiva was often hyperemic.

In 10 specimens of urine examined five contained albumin. The urine was usually dark brown, acid, of high specific gravity, and may contain casts. Anuria was a common symptom in the myalgia type, in one case existing 58 hours, whereas the early desire to urinate was a frequent symptom in the prostrated type.

In five myalgia cases the red blood corpuscles varied from 5,500,000 to 9,435,000, averaging over 6,000,000. The white blood cells were increased in the same proportion. The hemoglobin was a hundred per cent in all cases examined. The forced draft runs were unanticipated by the medical department of this ship, which, together with the stress of the circumstances, prevented preparation being made for more complete laboratory examination, which in future may prove a fertile field for research.

The body temperature was taken by the mouth some minutes after the cases had left the firerooms. In 24 cases one had an initial temperature of 96.6° F., 2 cases of 97 to 98° F., 18 cases from 98 to 99° F., and 3 cases from 99 to 99.8° F. No case of subsequent hyperpyrexia was observed, the highest temperature, except when complicated by appendicitis, was 99.8° F. Subnormal temperatures were usually noted in the prostrated type; this type, as a rule, showed a slight subsequent rise.

Practically the entire engineer's force manifested symptoms of gastritis during the trip. The most constant and important symptom was gastralgia. The pain was located in the epigastrium just below and to the left of the ensiform cartilage and was little affected by pressure. This gastralgia seems to disappear shortly after they leave the fireroom, to immediately reappear when they resume their watch,

and is presumably due to the direct action of the heat. Anorexia, associated with interval vomiting, was common, some cases being unable to retain even water. This failure to replenish the fluids of the system probably predisposes to the cramps. Constipation was present in most of these cases—12 out of 25 cases gave a history of over a day, giving very little idea of the maximum extent of this symptom, as the statistics were taken when the cases were first admitted, which in some of the cases was the first or the second day of the forced draft run.

The myalgia type, as a rule, presented a flushed face with dry skin, rarely with profuse perspiration. All cases of prostration were covered with cold perspiration. Many stated that they had perspired so much that at times they seemed unable to perspire any more; probably signifying that, as the sweat glands are under central nervous control, this cessation of perspiration was apparently an attempt of the system to conserve the remaining fluid of the body.

Aphonia was present especially in the prostrated cases. About half of the cases manifested acute bronchitis with cough and expectoration, probably caused by the irritating action of the hot dry air and the inhaled coal dust.

CLINICAL TYPES.

Prostratio thermica.—M. W., oiler, age 28, previous service three years. Patient is tall, thin, and somewhat anæmic. He states that he felt "bad" and generally "run down" before the trip; that on his first watch he felt dizzy, and the heat seemed to affect him more than usual. On the second watch this increased so much that at times he had to sit down to keep from fainting. In the eight hours' rest between the second and third watches he stayed on deck, but recuperated very little. On his third watch he was advised to come to the sick bay by the engineer officer, but preferred to stand his watch if possible. During the latter part of this watch he fainted and was brought to the sick bay in an unconscious condition. Pupils were dilated, pulse barely perceptible, face pale, and covered with cold perspiration; muscles flaccid, respiration shallow, and all other symptoms that are characteristic of syncope. Temperature on admission 97.6 and subsequently rose to 99.8. Patient was on sick list seven days.

Myalgia thermica.—H. C. K., fireman first class, age 26, previous service three and one-half years. Patient is normal in size and has good physique. He was brought to sick bay semiconscious, but could be aroused by pressure on his supraorbital notches. Both legs and thighs were firmly flexed, the recti muscles were tightly contracted, and cramps of a moderate degree were noticeable in the arms. Pulse was not weak, face not pale, respiration fair, perspiration not profuse, pupils normal in size and reaction, and temperature normal. A warm bath and constant massage were ordered and large amounts of warm water were given to drink. After 30 minutes mind was clear, pulse stronger, and patient felt somewhat prostrated but not markedly so. In about two hours the cramps had disappeared from the extremities, but every three to five minutes he was seized by painful spasms of certain portions of the abdominal recti, and in the intervals between these spasms fibrillary twitchings were observed. Further enumeration of symptoms would be a repetition of former reported cases. He was soon able to walk, and resumed his next watch eight hours later. He stated that he felt well at the beginning of the run and had suffered no ill effects from the preceding

watches. He had just finished a four-hour watch "feeling fine" and had stopped under a blower on the gun deck to cool off a little when he was unexpectedly seized by the cramps and had dropped on the deck, semiconscious, in which condition he was found by one of the hospital corps.

The contrast between the above cases is evident. The first presents a marked asthenic condition with a history of a predisposing state of impaired health, premonitory and increasing symptoms, little improvement between watches, complete unconsciousness, subnormal temperature with a slight subsequent rise, the long convalescence, and flaccid musculature. In the myalgia thermica case the asthenic condition was not present, no history of impaired health, absence of premonitory symptoms, a sudden and unexpected attack, semiconsciousness, normal temperature, and muscular contractions with rapid recovery were present. All cases, however, did not show such sharp contrast as the above, yet they tended to follow more or less closely the main symptoms. Some cramp cases show prolonged recovery, premonitory symptoms, and subnormal temperature.

Mixed type of myalgia thermica and prostratio thermica.—E. S. S., master mechanic second class, age 35, previous service one year. Patient was brought to sick bay in a syncopal condition, completely unconscious, with symptoms similar to the first case, but in addition he had tonic muscular contractions of both legs and thighs. He was incapacitated 10 days.

The conspicuous asthenic condition and total unconsciousness accompanied by cramps presents a combination of the main symptoms of the first two cases, and an investigation of the etiology suggested a mixed type. His duty as oiler to the blowers kept him from 10 to 30 minutes at a time in the area of overheated air, which provoked profuse perspiration, that was rapidly evaporated by his resting from 10 to 30 minutes under the blowers. Here we have the condition that caused rapid abstraction of water from the tissues, alternating with the depressing action of the area of the superheated air on the medulla, thereby predisposing to a state of collapse, accompanied by muscular contraction.

MUSCULAR CRAMPS.

This refers to the tonic contractions of voluntary muscles, usually accompanied by excruciating pain, and is the predominating symptom in myalgia thermica. The muscles were frequently knotty and unevenly contracted, and the contractions are generally of "stone-like" rigidity. The cramps observed have been limited to the voluntary muscles, principally the flexors of the abdomen and extremities. No cases of cramps in the muscles of thorax and back have been noted, although involvement of these muscles and apparent diaphragmatic spasm has been reported. They frequently involved the muscles most employed, as shown by seven cases of cramps in the right

supinator longus muscles among those handling the slice bar. A few unilateral involvements of the cervical muscles in the side exposed to the draft have been seen. In 21 cases of myalgia thermica the cramps were located as follows: In the abdomen and extremities, 11 cases; in abdomen, 1 case; in abdomen, right leg, and left arm, 1 case; in arms, abdomen, and right leg, 1 case; in legs, 3 cases; in legs and abdomen, 1 case; in arms, 1 case; in arms and abdomen, 1 case; and in legs and arms, 1 case.

In 20 cases the cramps were first noticed after being on watch: Twenty to thirty minutes, 2 cases; 1 to 2 hours, 6 cases; 2 to 3 hours, 4 cases; and after completion of watch, 8 cases. In the majority of the milder cases they did not appear until after the individual had left the fireroom; consequently the action of heat in the production of cramps is presumed to be indirect. May²⁸ reports one case with cramps beginning 7 hours after he had left the fireroom. Often sudden drafts, cold baths, and other sensory stimuli precipitated the attack of cramps. One oiler gave a history of 10 such attacks in the service.

The cramps observed were divisible into local and general. The general type was more severe, tended to be bilateral and evanescent in character, and seemed to be neurogenic, due to some action of a stimulus of the spinal cells. The local type was often unilateral, affecting muscles most in use or exposed to the drafts, and appeared to be due to the direct action of some stimulus on the nerve endings or the muscle fiber itself (coagulation of the muscle plasma?). Closely related to the muscular cramps was myalgia or general muscular distress. This seemed different from the soreness and stiffness of over-exerted muscle, as it occurred irrespective of the previous experience of the individual and the character of the duty performed.

It has been demonstrated that the affected muscles in thermic rigidity show acidity and fail to react to galvanism;⁴ also that over-exertion makes the myosin prone to thermic coagulation. Stannius⁹ and Brown-Sequard⁸ have verified the results obtained by John T. McKay¹⁰ that rigid muscles, including post-mortem rigidity, may be made pliable by the injection of warm salt solution, and this seems an important point to remember in the treatment of cramps. Further theoretical discussion of the nature of the cramps will be reserved for a later date. Are these cramps simple muscular contractions or coagulation of the plasma, which is rendered more coagulable by the accumulation of katabolic products?

I hesitate to estimate the probable number of cramp cases without more authentic sources. The statistics of the milder cases were kept by the hospital apprentices for my own satisfaction with little idea of later publishing the results. Although only about 40 cases were recorded on the Panama trip, the hospital steward estimates the

number to be over 100. It was discovered later that the apprentices, being too busily engaged, or for other reasons, failed to keep a complete record, especially of the cases which happened at night.

DIAGNOSIS.

This was usually not difficult. Only two questionable cases of malingering were seen, and they were given the benefit of the doubt. These were regarded as suspicious because of the unpronounced rigidity of the contractions, the occurrence of the symptoms after brief exposure to the excessive temperature, ability to employ the affected muscle during a "cramp," the small amount of force necessary to extend the flexed limb, and the general nervous appearance of the patient.

The "cramps" are well-recognized and lightly regarded symptoms by the more experienced men, some cases being literally forced to come to the sick bay by their companions. They generally preferred the self-administered treatment of massage and muscle manipulation than to come to the sick bay and run the risk of being placed on the sick list. In their opinion, it is a physical disgrace and a sign of a weakling to succumb to the natural environments of their chosen rating, and perhaps furnish a source of amusement to some inexperienced recruit, who may be entirely unaffected by the heat.

TREATMENT.

Since the U. S. S. *Tennessee* first went in commission in 1906 it has been the custom of the engineer's force during forced-draft runs to bring their buckets of drinking water to the dispensary and have tincture of zingiberis in proportion of 5 to 10 minims to the pint placed in them. The precipitation of the resin gives a milky appearance to the water and, by psychic effect and expectation of beneficial results, encouraged free drinking. They were warned against this practice and advised to use oatmeal in the water. After investigating the subject and talking to some of the older men I am inclined to think that small amounts of ginger are beneficial in preventing the gastralgia. Acting on this assumption, during the latter part of the Panama trip, a stock prescription consisting of tincture of nux vomica, chloroform, tincture of capsicum, and oil of peppermint was used. The results of this "crème de menthe medicine," as it was called, in the relief of gastralgia was very gratifying. I have later discovered that the tincture of nux vomica has been highly regarded as a prophylactic in heat exhaustion.

In cramp cases a warm bath and constant massage were given at once. Stimulation was only required in the severest cases and morphine was seldom administered. The main object is to supply the

lost fluids as quickly as possible. This was accomplished by giving warm water by the mouth and rectum. In no case was it deemed necessary to resort to hypodermoclysis or intravenous injection. Constipation was nearly always present and received secondary consideration. Nothing but drastic purges gave result, and these were inadvisable on account of the existing gastro-enteritis; besides, purgation defeats the main object of supplying the lost fluid. During one forced-draft run six men came to evening sick call and each wanted a "physic." This seemed a good opportunity to record their ability to withstand purging. Each of these six men were given calomel, grains 3, in doses of one-half grain every 30 minutes. Next morning at 8 a. m. three of these six were given 2 ounces of a saturated solution of magnesium sulphate, and at noon two of these three were given 1 ounce of castor oil, and then finally, at 2 p. m., one of these two was given an enema of green soap and water, and repeated two hours later. No positive result was obtained on any of these six cases within 24 hours.

The treatment of *prostratio thermica* was the same as that of syncope.

COMPLICATIONS AND SEQUELÆ.

Six cases³³ of appendicitis were transferred ashore shortly after arrival at Colon. Each had been on duty in the firerooms and four of them had been previously admitted with heat cramps; consequently it is assumed that the excessive heat was a direct or indirect pathogenic factor.

Abscesses, furunculosis, and other pus infections were more prevalent after forced-draft runs.

Seven cases of jaundice appeared one to two weeks subsequent to the trips. Obstipation was common; one case of two weeks' duration was treated.

Impaired mentality, with desire to jump overboard, has been reported by Meyer¹ and Kennedy.³¹

One case of pulmonary tuberculosis was diagnosed six months later, who attributed his first cough and expectoration to the bronchitis acquired during the forced-draft run.

A few cases of the so-called condition of "fireman's heart"²¹ were detected. This seemed to be an atonic condition of the heart and is often accompanied by a presystolic murmur. As a rule, no subjective symptoms are complained of by the patients. Five out of twenty-eight firemen examined presented this condition.

One death has been reported in the naval service²⁴ from heat cramps, and I have been informed personally of another.

Acute and chronic catarrhal affections of the nose, throat, conjunctiva, and middle ear appear to be more prevalent among the

engineer's force, apparently due to the evaporation of water from the mucous surfaces by the hot, dry air.

Gatewood²³ states that there is "evidence to show that exposure in the fireroom" to "conditions that put a large load on the kidneys while depriving them of the fluid necessary to flush themselves properly" predisposes to nephritis.

In most of the cases observed, the recovery has been rapid and uneventful, yet it is reasonable to suppose, in exposure to such abnormal atmospheric conditions, that the "heart, kidneys, and stamina" of the individuals are severely tried, and a more diligent search may reveal various other permanent pathological conditions.

CONCLUSIONS.

That prostratio thermica is "virtually a syncope."¹²

That myalgia thermica is a distinct pathological entity, differing clinically and etiologically from the classical description of the condition known as prostratio thermica; yet they may coexist.

That the tendency to the epidemic incidence of myalgia thermica is such a striking phenomenon as to warrant a tentative assumption that some microorganism is an active agent in the production of heat cramps.

And that the microorganism, whose habitat is now unknown, while capable of existing harmlessly in the body under ordinary conditions, demands for the production of symptoms a state of excessive heat with concomitant circumstances that favor an extensive abstraction of the tissue fluid in a somewhat analogous manner as cold and humidity predispose to pneumococcal and influenzal infections.

That further investigation into the etiology of the pathological conditions due to heat may demonstrate that myalgia thermica and siriasis are closely allied affections, and perhaps are caused by the same pathogenic agent, the difference in symptoms being due to certain variations in atmospheric environments.

Without any authentic sources to substantiate this assertion other than superficial observation and investigation, it seems that wet-bulb temperatures from 86° to 100° F. predispose to prostratio thermica; that temperatures above blood heat, if associated with high relative humidity, predispose to siriasis, which pathological state may present muscular contractions if there has been much loss of tissue fluids by perspiration. Also that temperature above blood heat, but with low relative humidity predisposes to myalgia thermica. Summarily stated: heat with deficient thermolysis causes syncope; higher temperatures predispose to siriasis; but if normal thermotaxis accompanies this higher temperature, myalgia thermica may be produced.

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DETECTION OF METHYL ALCOHOL.

By Hospital Steward C. SCHAFER, United States Navy.

A wide experience has proved that many of the tests recommended for the detection of methyl (wood) alcohol result, too often, in findings that must be classed as questionable. For example, the test prescribed by the United States Pharmacopœia when applied to mixtures containing from 2 to 10 per cent of methyl alcohol very frequently fails to give a positive result, for, instead of the rose-red ring that is described, a cloud bearing a very faint pink tinge is all that is generally obtained, a result that leaves one in doubt, especially as on numerous occasions this same ring of faint pink tinge was obtained with pure ethyl alcohol. The methyl salicylate test is even more unreliable, as the odor of wintergreen is always obtained by using pure ethyl alcohol.

Until recently the reliable methods for the detection of this substance were of such a nature that they could not be applied except where an abundance of apparatus and more or less unusual reagents were at hand.

In 1910, G. Deniges devised a method by which the fuchsin bisulphite (Schiff's) reagent was caused to yield a positive reaction with formic aldehyde only. As this method is extremely simple, and requires only the commonest of reagents and no special apparatus, it was thought desirable to test the method and prove its worth. To this end the following experiments were carried out with results as noted: Mixtures containing as little as 0.1 per cent of methyl alcohol in ethyl alcohol gave a decided positive reaction. Repeated tests on pure ethyl alcohol gave in each case a negative result. Mixtures containing from 0.1 to 10 per cent methyl alcohol in water were tested; in these a positive reaction could not be obtained when less than 0.5 per cent was present. Aqueous solutions of mixed alcohols containing as much as 80 per cent water and as much as 0.2 per cent methyl alcohol failed to give a positive reaction, but above this quantity of methyl alcohol the reaction was decided. The decrease in delicacy noted in the last two sets of experiments is probably due to the absence of sufficient alcohol to permit formation of acetals, which bodies seem to be essential to insure the oxidation of very small quantities of methyl alcohol to formic aldehyde. Samples of whisky, gin, brandy, bay rum, liniments, etc., to which from 0.1 to 10 per cent methyl alcohol was added all gave a positive reaction; the same samples before the addition of methyl alcohol all gave negative results. In none of these tests was distillation resorted to, the test being applied direct to the specimens; it is advised, however, to distill when possible.

The following is an abstract of the method and its application as given by Deniges in his original article:

Place 0.1 c. c. of the specimen in a test tube, follow it by the addition of 5 c. c. of a 1 per cent solution potassium permanganate and 0.2 c. c. concentrated sulphuric acid; thoroughly mix the solutions by shaking and allow to stand 3 to 4 minutes. Now add 1 c. c. of 8 per cent solution oxalic acid, shake and allow to stand until mixture assumes a yellow color, then add 1 c. c. concentrated sulphuric acid and 5 c. c. fuchsin bisulphite solution, mix and allow to stand. The presence of methyl alcohol is indicated by the violet color which gradually develops.

To establish mixtures of extreme delicacy, the addition of 1 or 2 drops (not more) of pure ethyl alcohol to the 0.1 c. c. of specimen before the addition of potassium permanganate is recommended as a routine measure. This step, however, could be omitted if it is certain that the alcoholic mixture under investigation contains more than 30 per cent of mixed alcohols.

The intensity of the reaction depends on the quantity of methyl alcohol present, the shade being noticeable in one minute when over 0.5 per cent of it is present, and in five minutes when present in as small a quantity as 0.1 per cent.

In very weak solutions the color may appear blue at first, but when observed through the long axis of the test tube the violet color stands out prominently, the maximum of color developing in about 45 minutes. Our experience has been that the observation for the presence or absence of the alcohol can be safely made at the expiration of 15 minutes after the addition of the fuchsin bisulphite solution.

Solutions containing more than 1 per cent methyl alcohol show a graduated intensity of color during the first 25 minutes, but after that time the shade of a 2 per cent solution is apparently as intense as that of a 10 per cent. It is for this reason that the estimation of methyl alcohol by matching shades with equal volumes of solutions containing known amounts can not be readily accomplished.

The test is based on the following facts: (a) Small amounts of alcohols when treated with potassium permanganate and sulphuric acid yield acetals, the latter splitting up into aldehydes and alcohols. It is for the production of these intermediate bodies that the addition of ethyl alcohol to solutions containing much water is advisable. (b) Solution of decolorized fuchsin (fuchsin bisulphite) (Schiff's reagent) is a general aldehydic reagent with neutral or slightly acid solutions, but in solutions containing from 15 to 20 per cent by weight of concentrated sulphuric acid the color is restored only by formic aldehyde.

In support of the foregoing statement (b) it is perhaps well to state that solutions of various aldehydes and mixtures of various aldehydes, except formic aldehyde, were tested and in no case was a reaction obtained when the required quantity of sulphuric acid was present.

The maximum of color is developed in solutions of formic aldehyde when from 15 to 20 per cent sulphuric acid (by weight) is present.

If 30 per cent or more sulphuric acid is present a reaction is not obtained. The presence of other aldehydes does not interfere with the test for formic aldehyde.

Experimentally it was found that to obtain the most sensitive fuchsin bisulphite solution it should be prepared in the following manner:

Dissolve 0.5 gram of fuchsin in 200 c. c. distilled water; add an aqueous solution of sulphur dioxide, the quantity corresponding to 1 gram of sulphur dioxide gas; allow to stand until the solution assumes an amber color (this requires about one hour). Make up to 400 c. c. with distilled water. Mix well.

The colorless fuchsin bisulphite solution, which is obtained when more than one gram of sulphur dioxide is added to one-half gram of fuchsin, was found valueless as a reagent after standing 2 days. A solution prepared as outlined above will keep well for 10 days, although it is recommended not to use a solution over 7 days old. The amber color of the solution interferes in no manner with the test.

Although it is doubtful if occasion would arise where the detection of less than 5 per cent of methyl alcohol would be called for, this method is sufficient for the absolute detection of any quantity whatever.

U. S. NAVAL MEDICAL SCHOOL LABORATORIES.

Additions to the Helminthological Collection, United States Naval Medical School, March-May, 1912.

Accession No.	Name.	Host.	Collected by or received from—
19835	<i>Taenia saginata</i> (adult).....	<i>Homo</i>	Drs. Angwin and Munger, U. S. S. California.
19836	<i>Filaria</i> (adult).....	do.....	Dr. W. H. Connor, Tutuila, Samoa.
19837	<i>Opisthorchis</i>	<i>Felis domestica</i>	Dr. Garrison, Bureau of Science, Manila, P. I.
19838	<i>Necator americanus</i>	<i>Homo</i>	Do.
19839	<i>Paragonimus</i>	do.....	Drs. Edwards and Garrison, Manila, P. I.
19840	<i>Fasciola</i>	do.....	Dr. Garrison, Bureau of Science, Manila, P. I.
19841	<i>Dibothriocephalus</i>	<i>Felis domestica</i>	Dr. Garrison, Bureau of Science, Gandara, Samar.
19842	Tapeworm?.....	do.....	Do.
19843	<i>Clonorchis sinensis</i>	<i>Homo</i>	Dr. J. W. White, United States Public Health and Marine-Hospital Service, San Francisco.
19844	Empty <i>Paragonimus</i> shells.....		Dr. Garrison, Bureau of Science, Manila, P. I.
19845	Hookworm, whipworm, and <i>Ascaris</i> ova.		Naval Medical School.
19846	<i>Cysticercus pisiformis</i>		(?)
19847	(?).....	<i>Felis domestica</i>	Dr. Garrison, Bureau of Science, Manila, P. I.
19848	<i>Trichinella spiralis</i> (embryo).....	White rat.....	L. Avery, Naval Medical School.
19849	Tapeworm from cyst.....	do.....	Dr. Garrison and L. Avery, Naval Medical School.
19850	<i>Taenia saginata</i> (adult and head).....	<i>Homo</i>	W. J. Brandt, U. S. Navy, Norfolk, Va.
19851	Trematode.....	Mongolian cattle.....	D. A. Gregory, hospital steward, U. S. Navy, China.
19852	Nematodes.....	do.....	Do.
19853	do.....	White mouse.....	R. C. Miller, Naval Medical School.
19854	do.....	do.....	Do.

Additions to Pathological Collection, United States Naval Medical School, March-May, 1912.

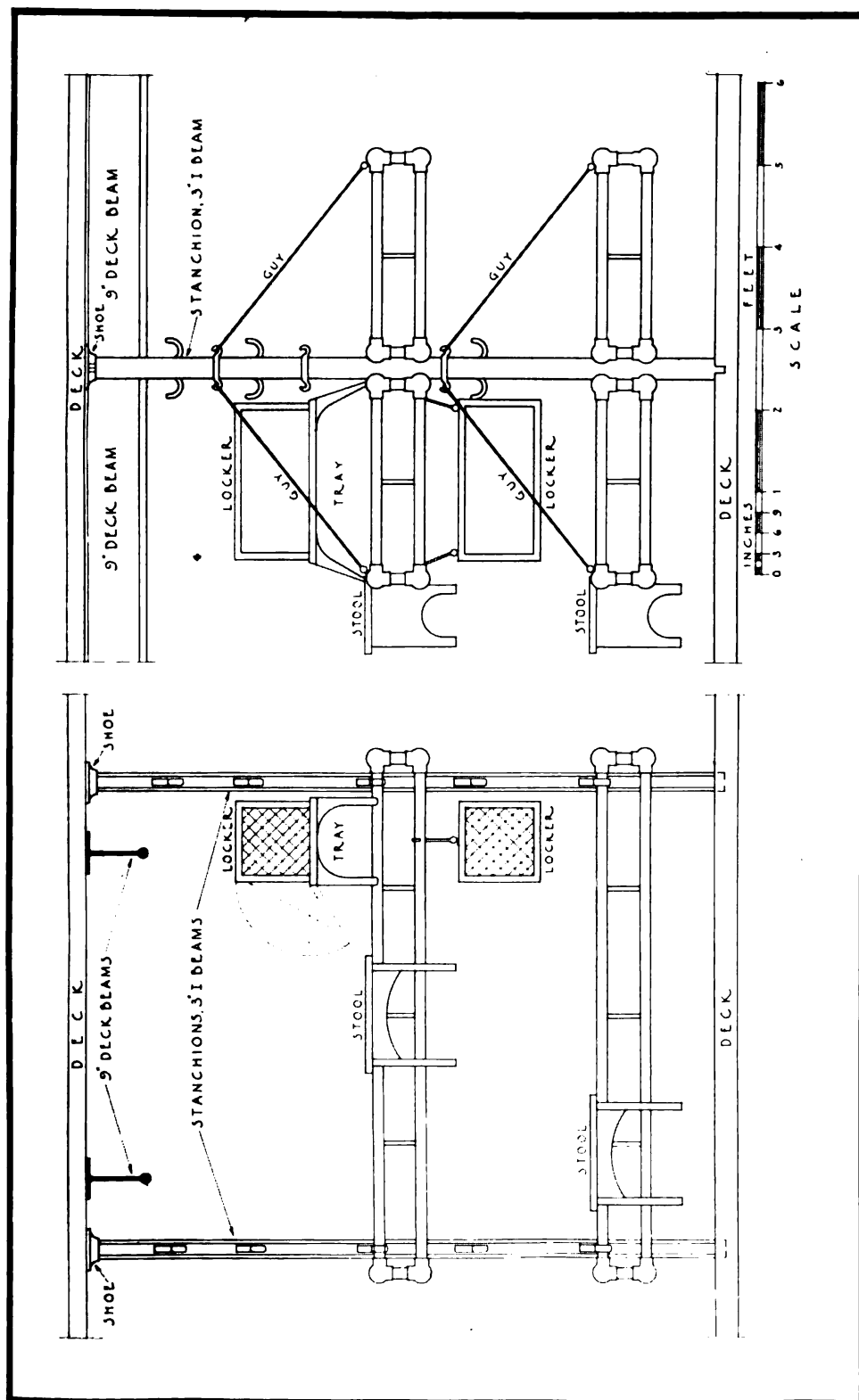
Accession No.	Tissue.	Diagnosis.	Collected by or received from—
723	Gland, axillary.....		Dr. R. Spear, Naval Hospital, Washington, D. C.
724	Venereal wart.....		Dr. A. H. Dodge.
725	Section nasal fossa.....	Cerebrospinal meningitis.....	Dr. G. F. Cottle, Naval Station, North Chicago, Ill.
726	Liver.....	Amyloid changes.....	Naval Hospital, Washington, D. C.
727	Spleen.....	do.....	Do.
728	Kidney.....	do.....	Do.
729	Adrenal.....	do.....	Do.
730	Blood clot.....		Do.
731	Liver, spleen, kidney, testicle, ulnar nerve, inguinal and femoral glands.	Leprosy, complicated with pulmonary tuberculosis.	Dr. W. M. Kerr, Guam.
732	Heart and aorta.....	Calcareous deposits in aorta....	Do.
733	Colon.....	Whipworms attached.....	Do.
734	Tongue.....	Gangrenous stomatitis.....	Dr. A. H. Dodge.
735	Lung, liver, spleen, and kidney.	Broncho-pneumonia with amyloid degeneration.	Do.
736	Tissues.....		Do.
737	Appendix.....	Appendicitis.....	Dr. C. J. Holeman, Indianapolis, Ind.
738	Brain and dura.....	Hemorrhage.....	Dr. J. G. Field, Naval Station, North Chicago, Ill.

Additions to Pathological Collection, United States Naval Medical School, March-May, 1912—Continued.

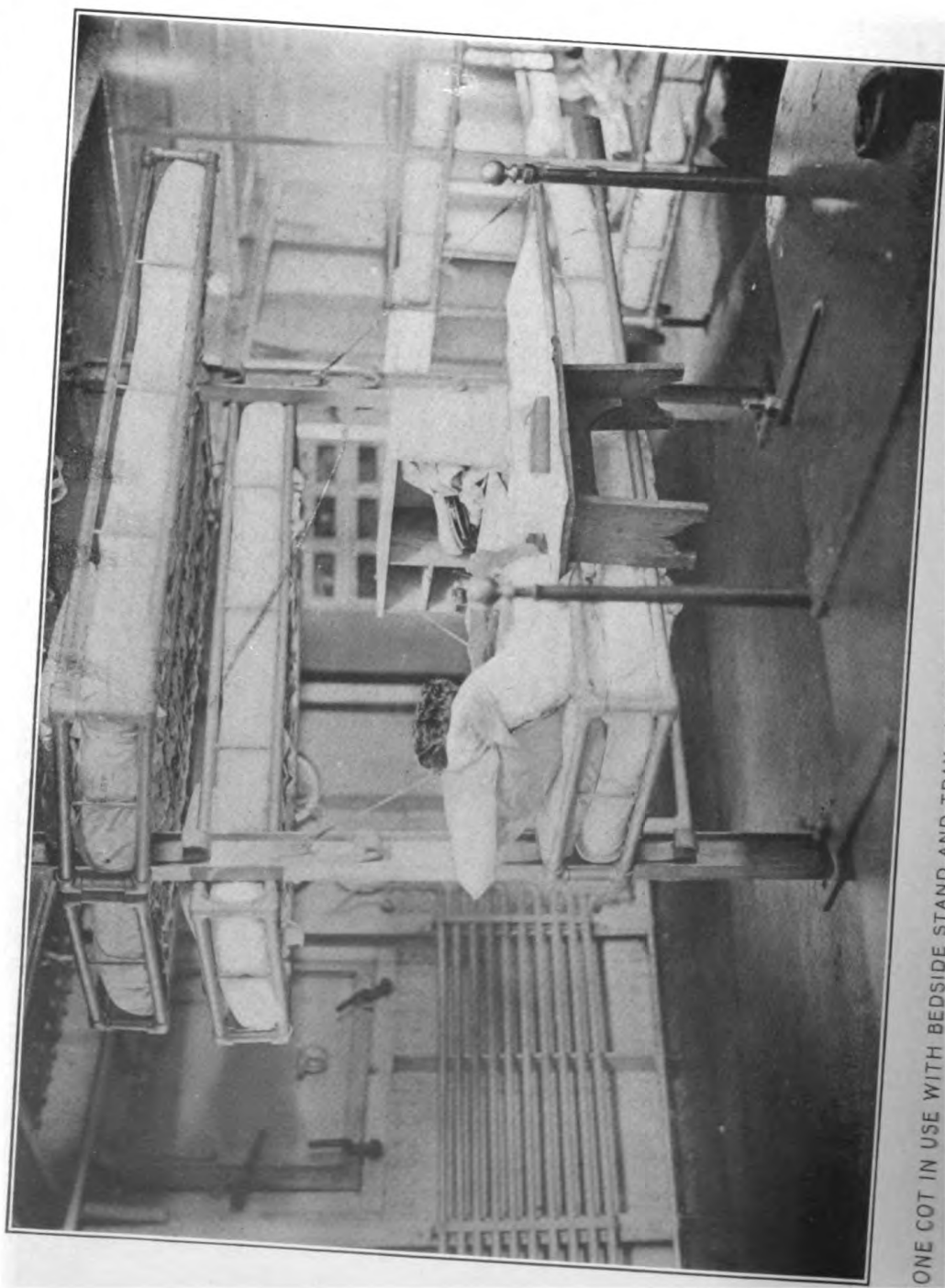
Accession No.	Tissue.	Diagnosis.	Collected by or received from—
739	Colon, transverse.....	Break in muscular coat.....	Naval Hospital, Annapolis, Md.
740	Liver, mesenteric gland of chicken.	Tuberculosis.....	Dr. W. S. Pugh, Puget Sound, Wash.
741	Smears.....	Vincent's angina.....	Dr. E. R. Stitt, Canacao, P. I.
742	Peyer's patch and mesenteric gland.		Naval Hospital, Washington, D. C.
743	Kidney.....		Do.
744	Lung.....		Do.
745	Kidney, etc.....	Pneumococcus.....	Do.
746	Glands, etc.....	do.....	Do.
747	Eye; choroid.....		Dr. E. M. Shipp, Naval Hospital, Washington, D. C.
748	Eye.....		Do.
749	Specimens from autopsy.....		Dr. M. E. Higgins, Naval Hospital, Washington, D. C.
750	Gland, mesenteric.....		Dr. C. M. Oman, Naval Hospital, New York.
751	Lungs (from cattle).....	Cysts.....	Dr. W. H. Connor, Samoa.
752	Nævus.....		Dr. R. Spear, Naval Hospital, Washington, D. C.
753	Glands of neck.....	Tuberculosis.....	Dr. H. A. May, Naval Hospital, Washington, D. C.
754	Tumor.....	Fibroma.....	Dr. R. Spear, Naval Hospital, Washington, D. C.
755	Liver and spleen of guinea pig.		Naval Medical School.
756	Beef liver.....	Cysts.....	Dr. J. M. Brister, Naval Hospital, Annapolis, Md.
757	Ileum.....	<i>Febris typhoides</i> (bleeding ulcers).	Dr. R. A. Bachmann, Newport R. I.
758	Spleen.....	Thickening of capsule.....	Dr. U. R. Webb.
759	Kidney.....		Do.
760	Heart.....	(?).....	(?)
761	Ovary and Fallopian tube.....	Carcinoma.....	Dr. R. Spear.
762	Heart.....	(?).....	(?)
763	Subcutaneous tumor.....	Endothelial sarcoma.....	Dr. W. S. Pugh, Naval Hospital, Puget Sound, Wash.
764	Gland.....	Tubercular.....	Dr. G. F. Cottle, Naval Station, North Chicago, Ill.
765	Testicle and epididymitis.....	Lymph scrotum.....	U. S. S. Princeton.
766	Axillary glands.....		Naval Hospital, North Chicago, Ill.
767	Tissue from rabbit.....		Naval Medical School.
768	Tissue from rabbit injected with human blood.	Acute nephritis.....	Do.
769	Epididymis and vas.....	Marked congestion in certain areas.	Dr. R. B. Williams, U. S. S. South Carolina.
770	Kidneys and suprarenals.....	Addison's disease.....	Dr. W. M. Garton, Norfolk, Va.
771	Brain from white rat.....	Cerebellar tumor.....	Naval Medical School.
772	Gallstones.....		Dr. A. M. Fauntleroy.
773	Lung, liver, gall bladder, pancreas, spleen, small intestine.		Dr. W. M. Garton, Naval Hospital, Norfolk, Va.
774	Section from prepuce.....	Syphilis.....	Dr. R. B. Williams, U. S. S. South Carolina.
775	Liver and spleen.....	Tuberculosis.....	Dr. E. R. Stitt.
776	Larynx.....	do.....	Dr. G. D. Hale.
777	Small intestine.....	do.....	Do.
778	Tissues from rabbit that inhaled lead dust.	No lead found in tissues.....	Naval Medical School.
779	Section from prepuce.....	Syphilis (?).....	Dr. R. B. Williams, U. S. S. South Carolina.
780	Peritoneal tumor.....	Melanotic sarcoma.....	Dr. W. S. Pugh, Naval Hospital, Puget Sound, Wash.
781	Urinary calculus.....		Dr. W. E. Eaton, U. S. S. Virginia.

Additions to the Miscellaneous Collection, United States Naval Medical School, Washington, D. C., March-May, 1912.

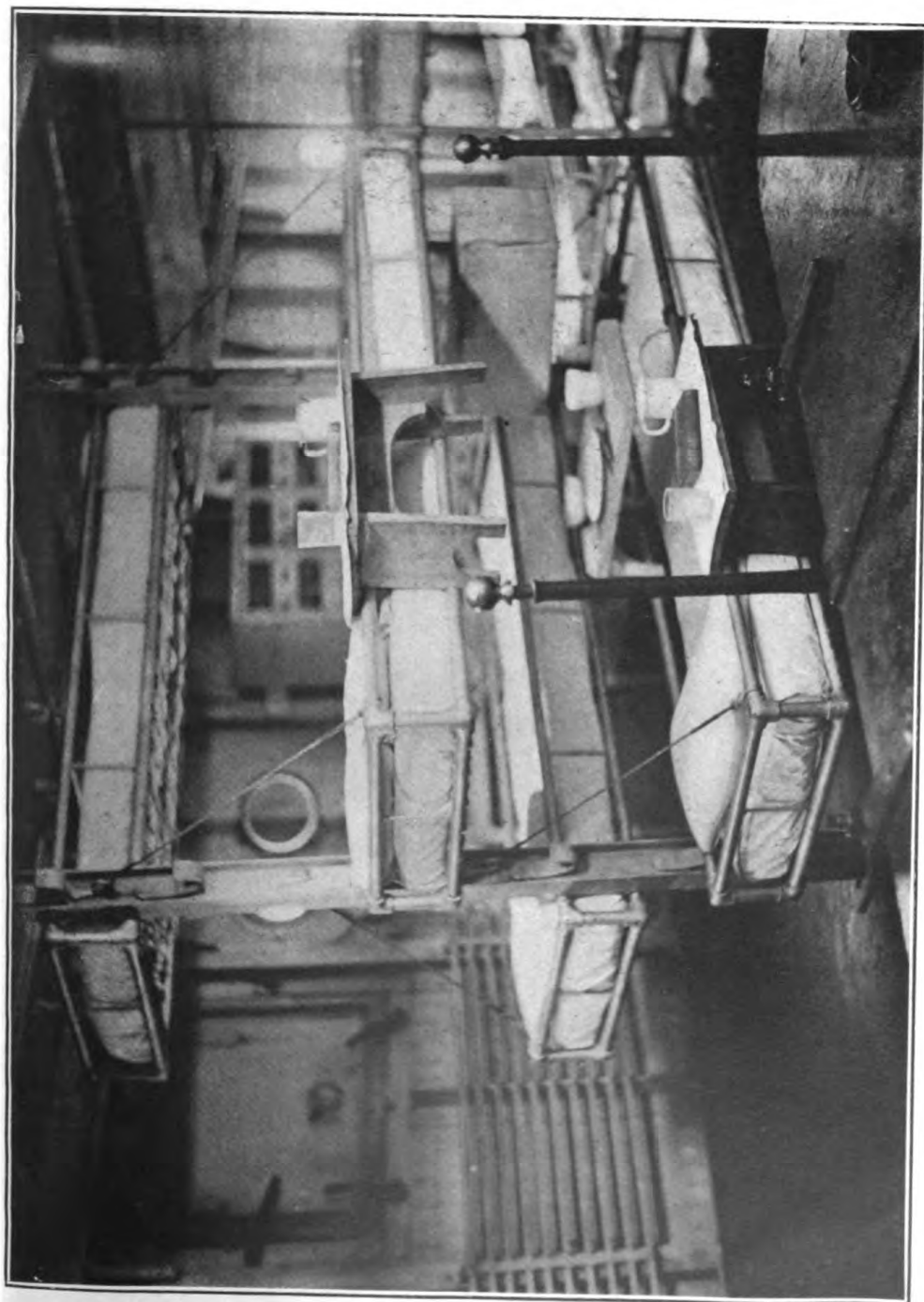
Accession No.	Name.	Locality.	Collected by or received from—
28	Mosquitoes.....	Nicaragua.....	Dr. Thornton.
29	Larva, insect.....	Tutuila, Samoa.....	Dr. E. U. Reed.
30	"Botete," poisonous fish.....	Guam.....	Dr. W. M. Kerr.
31	"Tetugui," poisonous fish.....	do.....	Do.
32	"Taraquito," poisonous fish.....	do.....	Do.



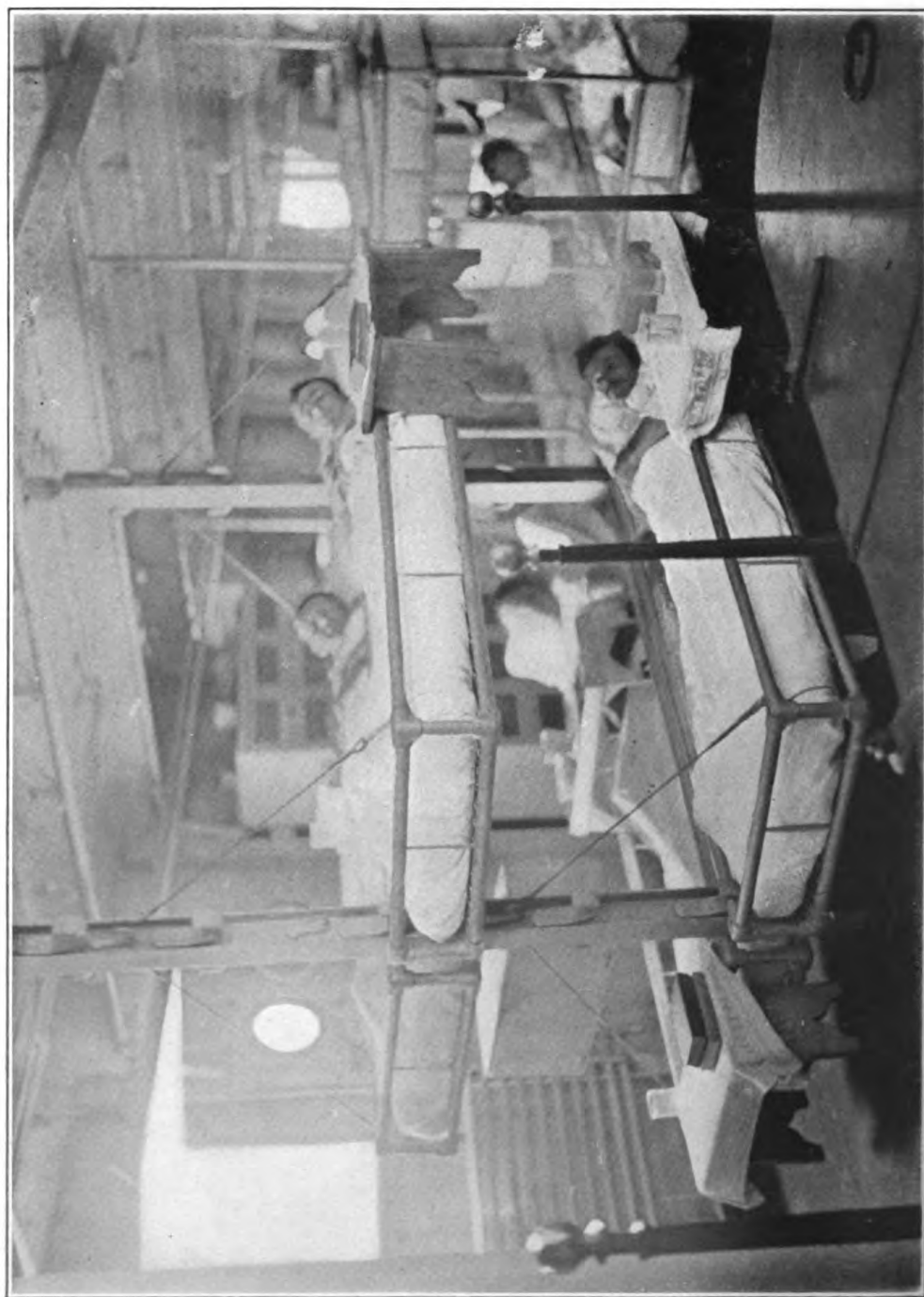
Side view. End view.
LOCKERS, TRAYS, AND BEDSIDE STANDS IN VARIOUS POSITIONS



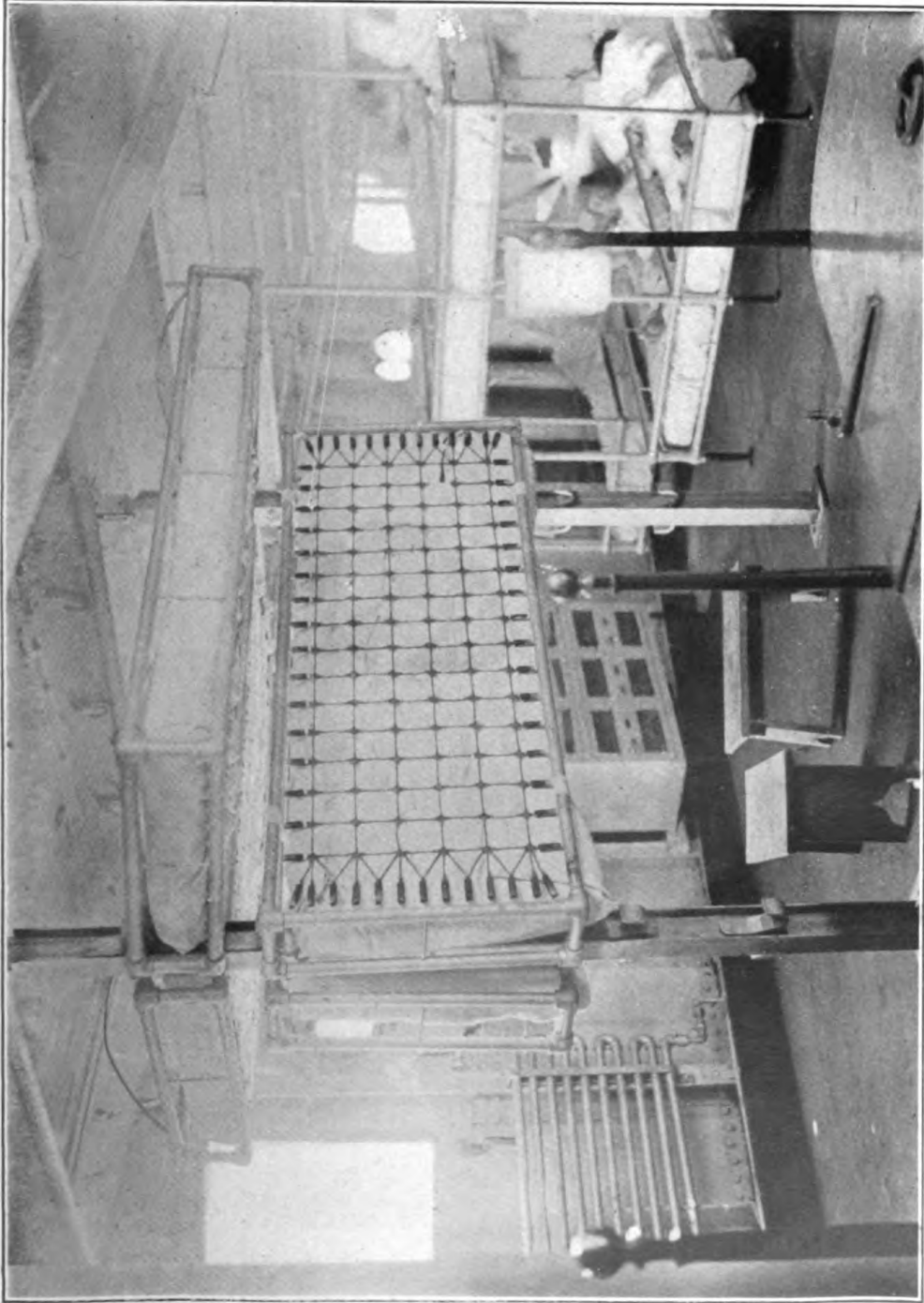
ONE COT IN USE WITH BEDSIDE STAND AND TRAY. LOCKER USED AS DESK. THREE COTS AT TOP OF STANCHION.



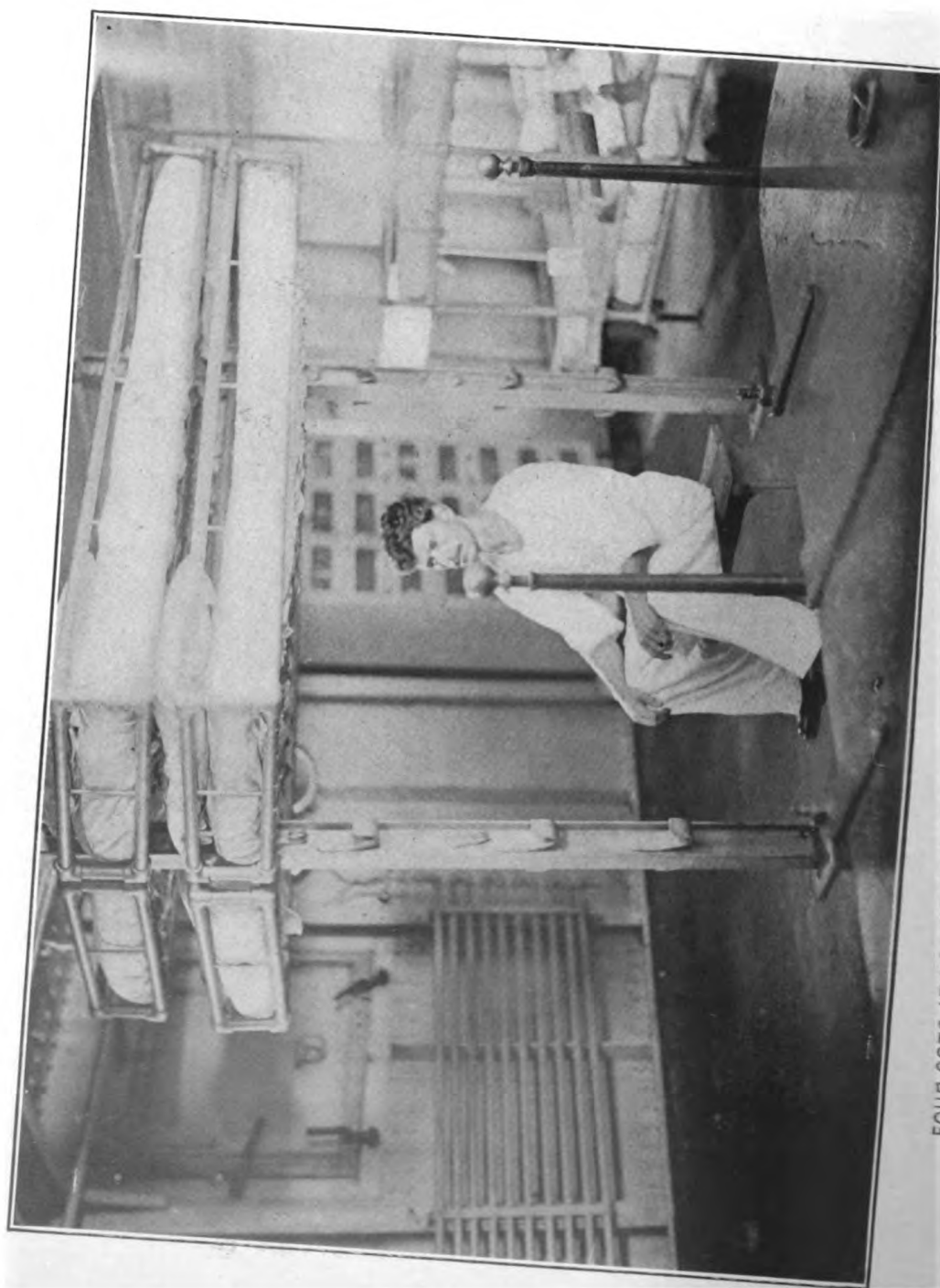
THREE COTS IN USE WITH BEDSIDE STANDS AND TRAY. LOCKER SUSPENDED. ONE COT AT TOP OF STANCHION.



FOUR COTS IN USE WITH BEDSIDE STANDS AND TRAY LOCKER SUSPENDED.



TWO COTS AT TOP OF STANCHION AND TWO FOLDED. BEDSIDE STANDS ON DECK



FOUR COTS AT TOP OF STANCHION. BEDSIDE STAND USED AS STOOL BENEATH THEM

SUGGESTED DEVICES.

A BUNK LOCKER, A TRAY, AND A BRACKET STOOL FOR USE IN SICK BAYS AND WARDS OF HOSPITAL SHIPS.

By Surgeon E. M. BLACKWELL, United States Navy.

In sick bays on board ship and on hospital ships, among the problems that confront the medical officer are the provision of a safe and convenient bedside locker for bed patients to stow their toilet and other articles and clothing that they like to have near at hand, a good bed tray and a convenient bedside stand. The lockers usually found in sick bays or hospital ships are generally situated some distance from the bunks, are not accessible to bed patients, can not be properly watched by the patients or nurses, and consequently various articles are often taken from them, much to the annoyance and discomfort of the patients.

The writer presents herewith drawings of a very simple portable bunk locker, a bunk tray, and a bracket stool which would meet all of the above requirements and add greatly to the comfort, contentment, and convenience of bedridden patients. These can be attached to and used with any of the standard Navy pipe-frame cots now used on board ship, and can be used equally as well with the improved Navy cot which the writer designed, a description of which appeared in the January, 1912, Naval Medical Bulletin. A set of these cots has been installed upon the hospital ship *Solace*, and these adjuncts are used in connection with them, greatly to the comfort and satisfaction of the patients.

The locker consists of a rectangular sheet-metal box 2 feet long, 1 foot high, and 1 foot wide. The front, back, top, and bottom are of solid sheet metal, while the ends are of perforated metal or coarse mesh, heavy wire gauze to give proper ventilation. The front of the locker is hinged at the bottom and, when opened, is held in a horizontal position by light chains and can be used as a tray for meals or to spread clothes and toilet articles upon, or it can be let down still farther and used as a writing leaf or to hold books and papers while the patient is reading. When being used, the locker sits in a tray which acts as a stand or support. It can be slid up near the head of the bed when being opened up or used, so the patient can get at it easily, and when not in use it can be put with the stand at the foot of the bunk out of the way of the patient or attendants, or swung to the cot above by hooks.

The tray is similar to some that are used on board certain ships of the Navy; but there is none of this pattern furnished the hospital ship *Solace*. It is made of sheet metal also. It is about 25 inches long by 14 inches wide and has four legs 6 inches high and well braced, which rest on the upper pipes of the frame of the cot, supporting the tray on which the locker rests. These trays can be nested on each other or on the lockers and thus occupy very little space in stowing.

The stool was designed by the writer shortly after the *Solace* went into service, and a number of them were made for use on board and have become almost indispensable in the wards. It is an ordinary stool 18 to 20 inches long and 12 to 14 inches wide. It has two strap hooks, one at each end, on one side of the under surface of the top. These hooks engage the upper pipe of the frame of the cot while the legs rest against the lower pipe, thus keeping the stool in a horizontal position and giving a firm platform. This stool is very useful, first, on deck as a seat; second, attached to the cot as a bedside stand; and third, to stand on in attending a patient in the upper bunk or in making it up. The stool can be attached to either the upper or lower bunk.

Sick bays on board ship and the wards of hospital ships are generally crowded and have insufficient space, and these adjuncts would result in considerable economy of room, as they would be kept on the bunks while in use and could be removed from the ward or stowed away when not in use. It would be well to have about one-fourth or one-half of the bunks equipped with these appliances for bed patients. For patients who are able to be up and about, the ordinary stationary lockers in the compartment would suffice.

The accompanying blue prints and photographs illustrate fully the usefulness of these adjuncts to the Navy cot and the manner of operating and using them. The photographs also illustrate the various ways and combinations in which the improved Navy cot can be used, showing the advantages of such a cot in a sick bay or ward over one which is fixed, stationary, or immovable.

A METHOD FOR USE IN OPSONIC INDEX WORK AND VACCINE STANDARDIZATION.

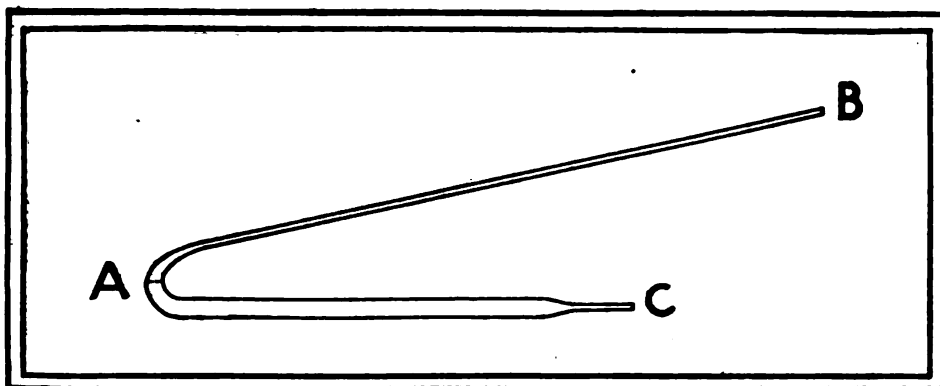
By Hospital Steward R. E. WEAVER, United States Navy.

The following technique for use in determination of opsonic indices has proven satisfactory and easily executed.

Glass tubing is drawn into Wright's U tubes as usually made with the exception that the capillary extension of the bent end B, is made considerably longer (as shown in the illustration) than in the ordinary Wright's tube.

The bacterial emulsion is prepared in the usual manner, using normal salt solution containing 1 per cent sodium citrate, at least 2 or 3 c. c. of the emulsion being made, and placed in a salt cellar or ordinary medicine glass in order that it may be picked up with a bulb pipette or medicine dropper having a capacity of 1 or 2 c. c.

A grease pencil mark is made at a point on the bend of the tube marked A. The ear or finger being punctured, blood is collected to this mark A. The flow of blood must be free as the capacity of the long capillary tube is quite large. When the blood reaches point A withdraw from source and admit a small portion of air. Now, fill the medicine dropper with the bacterial emulsion and, holding it with the bulb slightly compressed so as to keep a drop of emulsion hanging from the end, fill capillary tube to mark A. In a flame, seal the end C, having, in the usual manner, slightly warmed the tube so that, on cooling, the contents will be drawn out of the capillary section. The contents may then be thoroughly mixed by agitation or by rolling the tube.



The mixture of blood and emulsion is then jarred and shaken down into the sealed end and the tube placed in the incubator for the required length of time.

It is in the preparation of smears that this technique has been found the most advantageous. After incubation, shake or jar the contents into the bend of the tube, cut off sealed end with a pair of scissors and allow the desired quantity to escape through the capillary end (if it does not flow freely it may be easily started by blowing gently in the other end). A drop of any size desired may be deposited on a slide and there is no bubbling and frothing which is so difficult to avoid with a bulb capillary pipette.

This method has also been found to work most satisfactorily in the standardization of vaccines. Using a Wright's tube with a long capillary end, and admitting first a portion of blood, then air, then a portion of vaccine as described above for the bacterial emulsion, and finally several portions of a 2 per cent solution of sodium citrate, the end C is then sealed. The contents may now be thoroughly mixed and smears for counting prepared as above described.

CLINICAL NOTES.

A NOTE ON A CASE OF FISH POISONING IN GUAM.

By Asst. Surg. W. M. KERR, United States Navy.

A fish belonging to the family *Tetraodontidæ*, or broad-nosed puffers, which are characterized by their habit of inflating themselves with air when drawn from the water and which are called by the natives of Guam *botete*, was caught about 5 p. m., February 7, 1912, in the water off Merizo. It was cooked some time during the evening, and a small portion was eaten by an adult Chamorro about 9 p. m. His daughter aged 12, and a son aged 10, who was of a delicate constitution, ate the remainder about 5 a. m. the following morning. After breakfast the boy played on the beach near the home until 8 a. m., when he came to the house complaining of feeling very weak and tired, and of a severe headache. It was noticed that his face was flushed and that he was feverish. The local practicante about 8.30 a. m., administered a large dose of magnesium sulphate which caused the patient to vomit. He then stated that there was no sensation in his lips, tongue, hands, or feet. When seen about 9.15 a. m. there was intense congestion of the face and neck, rapid, full pulse, and labored respiration. This was quickly followed by the symptoms of cardiac failure with weak, thready pulse, shallow respirations, and unconsciousness. Death occurred at 9.45 a. m. The father felt weak and nauseated on awakening early in the morning and vomited shortly afterwards. He had no further disturbance. The daughter, who is unusually large and strong for her age, showed no ill effects beyond a feeling of lassitude and a pulse rate of 108.

Fish of this family are known to the natives to be poisonous and they cite numerous examples of death quickly following its ingestion. Three other fish caught in the waters about Guam are poisonous at times. One called in the native language *titugue*, is edible when under fifteen to twenty inches in length, but is poisonous when large. This fish attains a length of five or six feet and belongs to the family *Murænidæ*, or the morays. Two others, *taguafe* and *taraquito*, are edible except when they have fed on a marine plant called in Chamorro *catur*, which grows along the coral reefs. This plant stupefies the fish so that it swims slowly or floats near the surface of the water. It can then be caught by the fisherman's hand. This sluggishness is, to the Chamorro, the danger signal. If the fish is lively when caught

in the net it is considered safe to eat. Specimens of the above-mentioned fish have been sent to the United States Naval Medical School by the writer for identification.

TWO CASES OF CLIMATIC BUBO.

By Asst. Surg. E. W. PHILLIPS, United States Navy.

Climatic bubo is a widely distributed tropical disease of unknown ætiology, characterized by fever of an irregular type and the development of a bubo without demonstrable local cause. Cantlie and Luzzatti consider it to be a form of *Pestis minor*; the two cases here reported were in the beginning unpleasantly suggestive of plague.

Case 1.—C. S., seaman, white, aged 23; family history good; has always been well; no history or evidence of venereal disease. Patient was last ashore June 6, 1911, at Colon, Republic of Panama. On this occasion he had intercourse with two women, one native and one white. Previous to this date he had not been off the ship for a month.

On June 28, 1911, he came to the sick bay complaining of headache, weakness, and "grippy" pains in the back and legs, and stated that these symptoms, with occasional chilly sensations, had been troubling him for two days. His temperature was 99° F., rising in the afternoon to 101° F.; pulse 80, respiration 16. Physical examination showed only a slight enlargement of all the superficial lymphatic glands, in the right inguinal group assuming the features of a beginning bubo; the glands here were hard, discrete, and tender on pressure. The overlying skin was normal; there was no focus of infection on the leg, no venereal ulcer, and no urethral discharge. Examination of the blood, urine, and feces proved negative. The patient was put to bed and treated expectantly; tincture of iodine and a cold compress (there being no ice) were used on the bubo.

The following day there was little change, the temperature remaining near 101° F. The next day the glands were matted together and caused some pain; the evening temperature was 103.4° F. A leucocyte count gave 6,500 w. b. c. to the cubic millimeter; 59 per cent polymorphonuclears, 37 per cent lymphocytes, 4 per cent large mononuclear cells. No parasites found. The following day, July 1, the diagnosis of climatic bubo was made in consultation with Surgeon W. H. Bell, United States Navy, superintendent of the Isthmian Canal Zone hospital at Colon. Quinine bisulphate, 0.6 gm., was given 3 times daily, and the palliative treatment continued. For 3 days the temperature slowly fell, the bubo remaining much the same.

In the afternoon of July 5, the temperature began to rise, and on the 6th it reached 104° F. Still the patient was fairly comfortable, and the bubo showed no sign of suppuration. The white blood count was practically the same as before. With the high temperature there had appeared a general hard painless enlargement of all the palpable lymphatic glands, including the tonsils, much resembling the adenopathy of secondary syphilis. The spleen was not enlarged. The leucocyte count reached 11,800, with 69 per cent polymorphonuclears, 23.5 per cent lymphocytes, 1 per cent eosinophiles, 1.5 per cent transitional and 5 per cent large mononuclear cells. No parasites were found.

During the three following days the temperature declined in an irregular course to normal, the adenopathy became less marked, and the bubo less tender. The leucocyte count fell to 8,000, the percentage of large mononuclears remaining the same. It was decided that quinine had proved useless; it was stopped, and protoiodide of mercury in 0.02 gm. doses begun.

Another febrile reaction occurred on the 17th and 18th; the temperature subsided as usual and stayed down. The dose of mercury was increased to toleration. On July

25 the patient was allowed up. He had lost 13 pounds in weight, but was in fair general condition.

The adenopathy had disappeared, and the bubo was still large and hard, but not tender. He went to duty July 29, having been ill a month. The medication was continued for 1 week. On October 1, the bubo had entirely disappeared, and the patient's health has since been excellent.

Case 2.—J. W., fireman, first class, white, aged 24. Family history negative; gonorrhea two and one-half years ago, cured; no history or evidence of syphilis. He was last ashore at Colon June 6, when he had intercourse.

This patient reported at sick call July 1, 1911, suffering from headache, malaise, and tender swollen glands in the left groin and left axilla. He said that his symptoms began six days before (June 26) with headache, muscular pains, and swelling and tenderness of the glands in both groins and axillæ. On admission his temperature was 99.4° F., pulse 64, respiration 14. The lymphatic glands of the left axilla were hard, movable, and tender; in the left groin was a bubo similar to that noted in Case 1. No focus of infection was found on the leg or the genitalia. The urine and feces were normal, the blood negative as to parasites, the leucocyte count 10,800. The same treatment was given as in Case 1, except that urotropin, 1 gram three times a day, was given instead of quinine. His condition was stationary for three days. On July 4 the bubo and axillary glands became more tender and the temperature rose to 101.2° F. The bubo was punctured with a sterile hypodermic needle and 0.6 c. c. of bloody fluid withdrawn. This proved sterile at the end of 48 hours on ordinary media. Smears showed blood cells and lymphocytes, but no organisms of any sort.

During the next seven days the temperature was irregularly intermittent, reaching 100° or 101° at evening. The patient felt well, but lost some weight. There occurred a general painless enlargement of all the palpable lymphatic glands, but those of the left axilla lost their tenderness. The bubo slowly increased in size, this increase being due to a periadenitis. Several blood examinations gave results of which the following is typical: July 12, w. b. c. 6,400; polynuclears 50.3 per cent, lymphocytes 33 per cent, large mononuclears 8.3 per cent, transitionals 2 per cent, eosinophiles 6.4 per cent. No intestinal parasites or ova could be found.

The temperature gradually fell to near normal. On the 15th the urotropin was stopped, and Fowler's solution in ascending doses was tried. On the 19th there was little tenderness remaining in the bubo and the temperature was normal. The patient was allowed to sit up. On July 24 the pain and tenderness recurred, with some fever, which continued until the patient was transferred on July 29 to the naval hospital at New York. Here the glands were excised, but unfortunately the material was not submitted to a pathologist.

COMMENT.

While no conclusions can be drawn from two cases, certain points may be emphasized:

1. The time of exposure was known, and the period of incubation in these cases was approximately three weeks.
2. The onset was that of an acute infectious fever; the bubo developed secondarily, and was never severe enough to explain the temperature.
3. The clinical findings, viz, the low white cell count, with increase of the large mononuclear cells, the eosinophilia in Case 2, and the sterility of the aspirated gland juice, suggest that the infecting agent is a protozoan.

The diagnostic features were the absence of venereal disease; the fever, highest at the onset; the mildness of the subjective symptoms in relation to the temperature, and the occurrence of the disease in a region where it is known to be endemic. It is believed that a closer scrutiny of cases of bubo consequent upon visits to Central American ports would show climatic bubo to be not infrequent.

RUPTURE OF THE LEFT KIDNEY—NEPHRECTOMY.

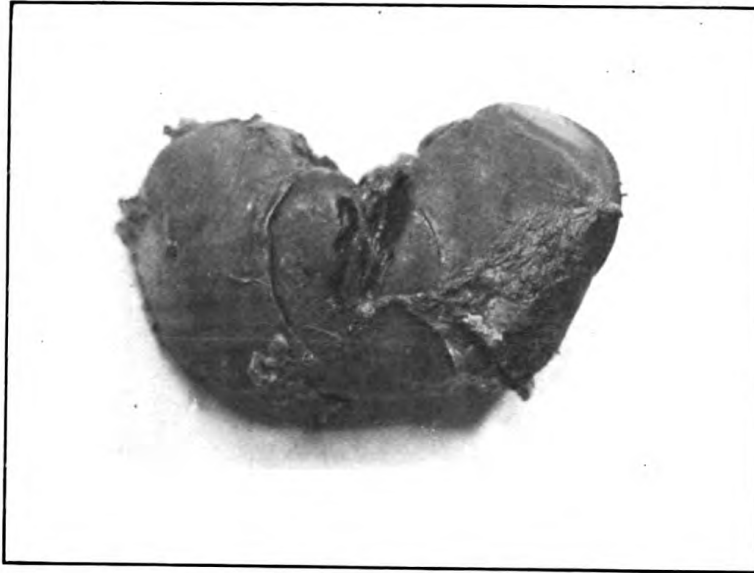
By Surgeon A. M. FAUNTLEROY, United States Navy.

This case was an interesting and instructive one from several points of view in that it illustrated how a considerable amount of damage to an internal organ can result from a very slight trauma, and also how meager the symptoms of such a case may sometimes appear, necessitating constant observation and study in order to arrive at a correct diagnosis.

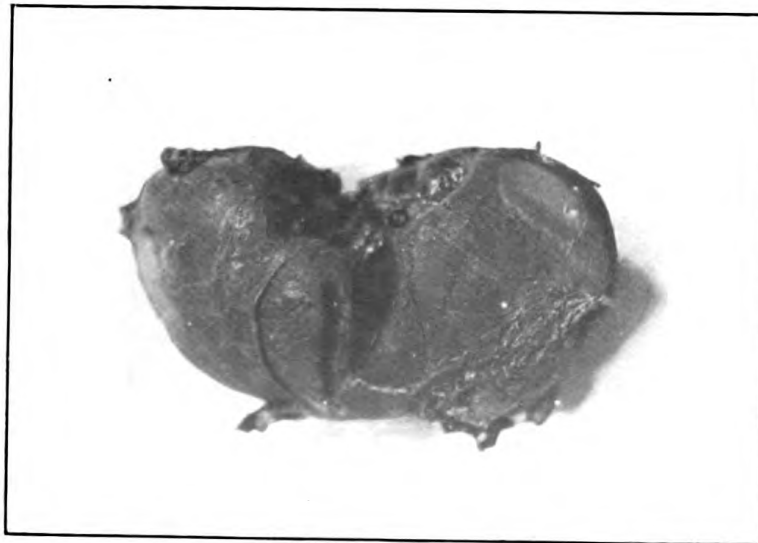
A. M. L., seaman, aged 21 years and of robust appearance, was received on board the U. S. S. *Solace* March 15, 1912, at 8 a. m., with a diagnosis of hematuria and the following history: While cleaning the side of the forward turret at 7 a. m., he fell a distance of 2 feet, striking the left side of the abdomen against the ball attached to the stock of a small anchor which was lashed to the side of the turret. Patient experienced practically no pain, but upon being seen by the ship's surgeon a few minutes after the accident he exhibited unmistakable signs of shock. He was removed to the sick bay and, shortly afterwards, voided about 300 c. c. of apparently pure blood and began to show more pronounced evidence of shock. He was given a hypodermic of 1/100 of atropin, and preparations made for his transfer to the *Solace* for further observation.

On admission to the *Solace* there was little or no evidence of shock, nor was there the slightest bruise to be seen on the body. Patient stated that he had had a bowel movement and had voided his urine about a half hour before the accident. Temperature 98° F., pulse 66, and respiration 20. At this time he was unable to void any urine and was immediately catheterized, the result of which was 450 c. c. of practically pure blood in which numerous clots were present. There was no pain over the bladder and only very slight pain on deep pressure under the left costal arch. There was no unusual dullness in the left flank, and patient stated that he was perfectly comfortable in any position. He was closely watched for a half hour, and his urine again withdrawn, 200 c. c. of blood with a few clots being obtained, but there was apparently no change in his condition.

At this time there were three conditions to be considered with reference to a diagnosis: Rupture of the kidney, rupture of the mucous membrane of the bladder, extraperitoneal rupture of the bladder, or



ANTERIOR SURFACE.



POSTERIOR SURFACE.

the remote chance of rupture of the ureter. It was not considered that the evidence was strong enough to warrant a positive conclusion for the reason that operative interference meant either a suprapubic incision or exposing the kidney through the loin and extra-peritoneal route, two widely separated points and, if either one were found to be an incorrect procedure, the patient would have been unnecessarily subjected to a serious and depressing operation, while the need for interference would still remain. In other words, the evidence favored the condition being rupture of the kidney, but it was far from a positive indication.

These facts being considered, and the patient's condition being unchanged, it was decided to wait for an hour and then proceed along whatever line the weight of evidence indicated, at the same time preparing for operation.

At the expiration of an hour 200 c. c. of blood were again withdrawn. At this time a reasonable surety was felt that the bladder could be excluded in that the urine had been voided shortly before the accident and the bladder, therefore, was almost empty at the time; that there was no tenderness over the bladder, and the temperature was normal. Further, the pulse had slowed up (54) showing a certain amount of kidney irritation and there was just a suspicion of increased dullness in the left flank.

The kidney was exposed by the Mayo incision with the hope that possibly the rupture could be sutured but, when the large amount of blood-clot had been cleared away, it was found that not only was there still active hemorrhage present but both on the anterior and posterior surfaces there was a large rent in the capsule and parenchyma extending, on both surfaces, from the convex border into the hilum. In addition to this the central part of the viscus was soft and pulpy so that suturing was out of the question. Having decided this point a long curved clamp was secured to the pedicle and nephrectomy was performed. The patient made an uneventful recovery and, since he is young and in robust health, it is quite probable that the other kidney will not only enlarge but always be able to do the duty of both.

The photographs accompanying this paper show the anterior and posterior surfaces after the kidney had been in alcohol for six weeks.

ABSCESS OF THE LIVER IN A YOUNG INFANT.

By Passed Asst. Surg. F. E. SELLERS, United States Navy.

About 5 a. m. on May 14, 1911, I was called to see a baby 92 days old who was reported as having convulsions. Upon my arrival I saw that the baby was in a moribund condition and my first idea

was that the baby was suffering from some intestinal obstruction, as it had incessant stercoraceous vomiting, abdomen markedly and uniformly distended and tympanitic, and the skin pale and cyanotic. Temperature 102.6° , pulse very rapid, thready, and compressible, cold extremities, and clammy perspiration. The abdominal distension caused dyspnea and shallow thoracic breathing. Owing to a limited knowledge of the native language and the indifference of the parents to give a correct history, it was very difficult to obtain a very full and satisfactory history of the child's illness, however, it was learned that the child had been ill for one week with fever, three days previous to death it was taken with a diarrhea for one day only, the stools containing traces of blood. This strengthened my diagnosis of intestinal obstruction, probably intussusception, as it is more common among infants and sometimes follows diarrhea. With the above diagnosis in view, an attempt was made to give normal saline solution high into the colon without any beneficial result. Patient died within two hours, and it was at autopsy that the liver abscess was found to be the cause of death.

Post mortem examination showed the abdominal cavity containing a large quantity, at least a pint, of thick, yellowish-brown pus streaked with blood and a marked peritonitis due to a ruptured abscess of the liver into the general peritoneal cavity. The abscess was located in the upper portion of the right lobe and completely penetrated the organ. The adhesions of the liver to the diaphragm, with the remains of an existing cavity between, showed that the abscess evidently ruptured first between the diaphragm and the liver and later below into the peritoneal cavity. The opening to the cavity would easily admit two fingers and the walls were hard and indurated. Scrapings were taken from the wall of the abscess cavity and examined microscopically, which showed a large number of *entamoebæ histolyticæ*, together with detritus and many liver and pus cells. At least six to eight *entamoebæ histolyticæ* could be seen in each microscopical field, and they seemed to be unusually active. The colon showed no evidence of existing ulcers. Further examination of the case was negative.

Evidently the disease progressed very rapidly, as the child was well nourished and revealed no evidence of a long illness. The baby was fed entirely by breast, consequently the source of infection was by water and not by food. The case is interesting on account of the extreme rarity of the disease in infants of this age, regardless of the fact that no dysentery preceded the abscess of the liver. In 1890 Musser found but 34 recorded cases of abscess of the liver in children under 13 years. No doubt since that time a few additional cases have been reported; however, the minimum age on record is not

stated, and not having access to sufficient literature on the subject, I am unable to state what the minimum age on record for this disease is, but I believe that this is one of the youngest, if not the youngest, cases on record.

APPENDECTOMY ON A HEMOPHILIAC.

By Passed Asst. Surg. B. F. JENNESS, United States Navy.

A general court-martial prisoner, age 23 years 10 months, with three years' service, was admitted to the sick list at the naval prison, Portsmouth, N. H., on July 30, 1910, with acute appendicitis. No history of previous attacks. The attack began with the usual symptoms during the night of July 29, and by next morning nausea and vomiting had ceased and pain become localized.

The writer saw the case on the morning of July 31, being called in the absence of the prison medical officer. After 36 hours of Ochsner treatment and ice applications the case was not improved. Pain was increasing; tenderness and rigidity were marked. Temperature and pulse were rising, and the nervous element in the case was becoming alarming.

Operation was performed an hour later; McBurney incision was made. The tissues of the abdominal wall were edematous. There was marked local peritonitis, involving the cecum, appendix, and portion of the ilium. The appendix was retrocecal, and both it and the mesoappendix were adherent to the posterior wall of the cecum.

The appendix was swollen, discolored throughout, and gangrenous near the tip. There had been rupture, and a fecal concretion was found in the lumen just distal to the rupture.

The appendix was removed by ligation at base, and sectional ligation of adhesions from base to tip. Drainage was established; no unusual hemorrhage occurred during operation.

About 1 a. m. on August 9 (eight days after operation) the writer was called hurriedly to control what appeared to be a secondary hemorrhage. The dressings and bedding were saturated with blood. The patient was weak and restless, the pulse rapid and thready.

The patient was anesthetized at once. Upon removal of dressings blood was seen welling up slowly from the depths of the wound. The wound was opened down to the cecum and enlarged by an incision through the border of the rectus. There were no bleeding vessels in the viscera or adhesions, but from every inch of the wound surfaces from the skin down to the peritoneum there was an oozing which resembled hemorrhage from the medulla of bone. The blood trickled into the depths of the wound, pocketed on the adhesions, and then filled the wound.

Bits of tissue were clamped and ligated, and then portions were ligated en masse, both with no effect upon the hemorrhage. Hot water, packing, adrenalin chloride, Monsel's solution, and tannic acid were in turn used, to no avail. As a final measure the actual cautery was used and the entire wound surface was lightly but thoroughly cauterized.

Hemorrhage stopped immediately; the wound was then packed with gauze saturated with adrenalin chloride. The patient was suffering from shock and loss of blood. In Trendelenberg position he was kept on the table for two hours, and during this time constant stimulation was maintained by rectal and subcutaneous administration of salt solution, hypodermics of strychnia, brandy, and digitalis, external heat, and precordial stimulation and massage.

At the site of each needle puncture for hypodermic medication and for salt-solution treatment oozing occurred, which required pressure and repeated collodion dressings to control capillary hemorrhage.

For a week following August 9 the wound was dressed daily with packing saturated in adrenalin, and each day oozing occurred, which was controlled by pouring adrenalin directly on the bleeding surfaces.

On August 26 a fecal fistula developed and rectal feeding was begun. The fistula closed September 4 and the patient made an uneventful recovery.

Recent blood examination in this case showed a coagulation time of 2 minutes and 15 seconds; white count, 9,200; hemoglobin, 90 per cent. Percentage of large lymphocytes normal.

There was no previous history of hemophilia in this case, and the patient has had no bleeding from wounds or from mucous membranes since the operation.

The negative history, the normal coagulation time of the blood, the normal percentage of mononuclear elements, and the normal or slightly increased white cell count in this case would not indicate congenital hemophilia.

On the other hand, abnormal cellular changes are not always present, and the coagulation time in hemophilia is frequently normal. Congenital cases are recorded in which the first hemorrhage occurred in adult life, even as late as 60 years of age.

Although facilities were not at hand for testing the blood pressure, palpation did not suggest a condition of high pressure, and no drugs were given which could have produced it.

Accepting the theory of Sahli, that "hemophilia is due to a chemical change in the walls of the blood vessels and is a disturbance of their function and not of their morphology," the writer believes that the case was one of true hemophilia, produced possibly by the toxins of appendiceal infection.

According to Sahli, fibrin ferment is formed by the union of thrombogen and thrombokinase in the presence of calcium, and that this or a similar substance is secreted by the vessel walls. In hemophilia the secretion of this substance is inhibited and clotting in the vessel mouths does not occur.

A theory to explain the absence of this secretion beyond a congenital one is not given, but it seems reasonable that in the event of increased metabolism, caused by an infection like acute appendicitis with peritonitis, the calcium element in this secretion would be lacking.

We know that calcium salts are overexcreted in the urine in nervous and other metabolic diseases, and it is believed that the occurrence of such metabolism in a subject with hemophilic tendencies might so deprive this zymoplastic substance of calcium as to render the thrombogen and thrombokinase inactive in the formation of fibrin ferment, and thus might be accounted for the first hemorrhage occurring late in the life of a hemophiliac.

EDITORIAL COMMENT.

NEW ACCOUNTING SYSTEM AT NAVAL HOSPITALS.

With the beginning of the fiscal year 1913 a uniform system of keeping accounts will be adopted at all naval hospitals. Heretofore the manner of making entries in the bill book of requisitions and vouchers, as well as their filing, and the system of accounts in the commissary department of hospitals, was influenced largely by the individual having charge of and responsible for this work in the administrative office. Thus, quite naturally, systems of accounting peculiar to each hospital were created in time, and these were frequently altered or changed altogether when changes occurred in the administrative or office personnel.

Confusion, more or less, resulted when new men were detailed for office work, and frequent requests were received in the Bureau for the retention of certain men at hospitals beyond their allotted period of shore service for the reason that they were the only ones familiar with the method of keeping accounts at the hospital concerned. But even more important than having the same system in operation at all hospitals and having all Hospital Corps members familiar with it, is the question of having at hand an accurate and concise knowledge of the financial affairs of a hospital for the information of its commanding officer when considering the essentials of economy and efficiency in the management of such an institution. Another object contemplated by the new bill book is the creation of a permanent record for ready reference showing the cost, fund from which paid, and date of completion of all construction work. At present none of the naval hospitals has a complete record of such work, and it is difficult, if not impossible, to secure accurate information as to the cost of the land, buildings, etc., comprising the several hospital reservations. This information regarding Government property becomes more and more valuable as time passes and is very essential for purposes of valuation and future appraisement.

At times, too, it becomes necessary to have in the Bureau an accurate statement showing the cost of the maintenance and operation not only of the hospital as a whole but of its separate departments with a view of comparing the cost of these with those of other naval as well as civil hospitals. This will be accomplished with the tabulation to be made on the new statement, "Cost of Mainte-

nance," to be submitted by each hospital at the termination of the fiscal year.

All persons connected with the Medical Department of the Navy should be familiar with the appropriate uses of the funds under the cognizance of the Bureau of Medicine and Surgery and utilized in the purchase of its supplies and the maintenance of its institutions. While this information may be obtained in a theoretical way from the "Instructions for Medical Officers," it is believed the practice of segregating expenditures at hospitals, both by appropriations and under department heads, as required in the new bill book, will lead to such knowledge of these funds as to prevent in future the misinterpretation of their applicability.

In addition to the desirability of a uniform accounting system for the commissary department of all hospitals, it is deemed essential for the man in charge to have access to an accurate knowledge of purchases and expenditures, the quantities of stores on hand, the value of same, and a ready method of computing the cost of subsistence for a given period.

The commissary ledger at first glance may seem intricate and somewhat formidable, but the daily posting of purchases and expenditures of supplies therein, as required, with subsequent balancing of the accounts, will soon make plain its scope and utility.

With the new form "Ration Return" an exact account can be kept of all persons subsisted at the hospital. In this connection particular attention should be given the quarterly "Statement of Members of Hospital Corps Subsisted," as the subsistence days entered on this form must correspond with paymasters' accounts, and checkage is made with the latter in the auditor's office. The frequent errors made in preparing this form have caused the Bureau much annoyance and correspondence in the past.

The many open-purchase requisitions from hospitals heretofore received in the Bureau for approval have needlessly multiplied paper work, and every effort should be made to reduce the number. To have all items on a requisition payable from the same appropriation is the most important consideration (Art. 1172, N. R.), the character of the supplies and the number of items being of secondary importance.

In the "Analysis of Expenditures" in the new bill book all purchases are classified under the several hospital departments, and no reason remains for limiting requisitions in this respect. Unless an article is urgently needed its requirement should be delayed until a sufficient number of necessary items have accumulated to warrant the preparation of a requisition, but such accumulations should not be carried so far as to make the estimated cost exceed \$500.—(C. F. STOKES, SURGEON GENERAL, U. S. NAVY.)

**THE RELATIONS OF THE AMERICAN NATIONAL RED CROSS WITH THE
MEDICAL DEPARTMENT OF THE NAVY IN WAR.**

Important legislation providing for the use of the American National Red Cross with the land and naval forces in time of actual or threatened war, has been enacted by the present Congress and was approved by the President April 24, 1912. It reads as follows:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That whenever in time of war, or when war is imminent, the President may deem the cooperation and use of the American National Red Cross with the sanitary services of the land and naval forces to be necessary, he is authorized to accept the assistance tendered by the said Red Cross and to employ the same under the sanitary services of the Army and Navy in conformity with such rules and regulations as he may prescribe.

SEC. 2. That when the Red Cross cooperation and assistance with the land and naval forces in time of war or threatened hostilities shall have been accepted by the President, the personnel entering upon the duty specified in section one of this act shall, while proceeding to their place of duty, while serving thereat, and while returning therefrom, be transported and subsisted at the cost and charge of the United States as civilian employees employed with the said forces, and the Red Cross supplies that may be tendered as a gift and accepted for use in the sanitary service shall be transported at the cost and charge of the United States.

The scope of the assistance which the Navy might desire and reasonably expect from the Red Cross in the event of a naval war was discussed by Surgeon General Charles F Stokes, United States Navy, in a paper read before the Ninth International Red Cross Conference, held in Washington, D. C., May 7 to 17, 1912. The Surgeon General pointed out that as the duties of the regular Medical Department are primarily military, not humanitarian, their services are at times indispensable in the accomplishment of military ends, and that humanitarian obligations must necessarily be left in part to such assistance as can be rendered by the Red Cross.

There are two basic principles which will guide us in seeking Red Cross assistance: First, that the Red Cross personnel shall not be exposed on or near the firing line; and, second, that their operations must be conducted strictly under the guidance and direction of the naval authorities. This last feature is of fundamental importance, and if not strictly adhered to efficient cooperation and coordination are impracticable. These facts have been well recognized by the Red Cross itself, as well as by the Army and Navy authorities, and the legislation referred to above will hereafter establish this principle on a firm foundation.

As the relief measures which would be required in a naval war are in many respects unique, the scope and character of some of the problems which the Medical Department of the Navy would, presumably, be called upon to meet in such a contingency were outlined, and the Surgeon General's plan for the evacuation of the wounded, including the organization and equipment of medical

transports and the establishment of great sanitary bases, was set forth

Although the difficulties confronting the Medical Department of the Navy are in some respects almost insuperable, there are certain questions which affect the evacuation of wounded on land that become simplified in naval warfare. Thus, when patients are received on board the medical transports, the next step is their removal to the sanitary base, and this procedure is varied only by the number of casualties and the distance of the area of operations. The naval wounded thus escape the numerous intermediary transfers which may be necessary in the evacuation of cases resulting from a battle on land—transfers which offer many opportunities for Red Cross assistance which do not exist in the naval service. Practically speaking, we may say that assistance will be afforded in three zones: First, on the "firing line," that is, aboard the fighting ships themselves; second, during transfer, on the medical transports; and, third, at the sanitary base or bases

The speaker estimated that it might be necessary to plan for the establishment of a sanitary base capable of caring for 10,000 of our own wounded and possibly as many more of the enemy as well, and emphasized the tremendous burden which the Red Cross would lift from the Medical Department if the attendants required were supplied by that organization. The personnel, which should equal at least 50 per cent of the probable number of wounded, would comprise "the nursing staff, men and women; the sanitary staff, such as those having to do with mosquito and fly problems, the disposal of refuse, disinfection, fumigation and incineration, and general sanitary police activities; the commissary staff, including dieticians, cooks, and mess attendants; and, in addition, laborers, teamsters, and others to attend to the heavy work involved. On the score of economy and efficiency there should be a staff of accountants and recorders "

An important opportunity for Red Cross assistance would consist in caring for men, permanently disabled, who might be discharged from the service on account of their crippled condition, a "class of fighting men that is soonest lost sight of and often most neglected, yet there is no class more worthy of consideration." Invaluable assistance could be rendered to them in various ways, "such as hastening the securing of pensions, selecting suitable habitations for them, and procuring such employment for them as they, in their crippled condition, may be able to undertake."

The Surgeon General did not dwell in detail upon Red Cross supplies, since this question "is largely a matter of funds, and in time of war funds will doubtless be forthcoming. Nevertheless, such assistance would prove of great value and be gratefully received. If sufficient funds were available they could not be used to better advantage

than by the donation of one or more hospital ships, fully equipped for service."

Doubtless the most serious difficulty confronting the Medical Department in time of war would be the necessity of securing large accessions to the Hospital Corps, and the most important field for Red Cross assistance would consist in enrolling and properly training Hospital Corps detachments for service afloat and ashore. "It is essential that such instruction should be uniform in order that the various detachments may work together harmoniously when united into larger groups. The special field of usefulness for such an organization would be on the medical transports, and the individuals naturally best adapted to fulfill the requirements would be drawn from out medical schools and civil hospitals."

If the proposed Medical Reserve Corps is established by law, as now seems probable, it is believed that in many of our larger medical centers groups, consisting of one medical officer (Reserve Corps) and 10 medical assistants—under Red Cross enrollment—would come into the service together.

In conclusion the Surgeon General stated that "activities intelligently engaged in by the American Red Cross along the lines thus briefly touched upon would be helpful, not only to large numbers of wounded, but to the Government as well, and would bring added laurels to an organization already replete with magnificent accomplishment, and, further, would tend to suppress the hysterical and purposeless outbreaks of sentimentality that have gone with war in the past, masquerading under the guise of patriotism."

PROGRESS IN MEDICAL SCIENCES.

GENERAL MEDICINE.

Surg. A. W. DUNBAR and Passed Asst. Surg. J. L. NEILSON, United States Navy.

OTIS, E. O., M. D. **Physical exercise and blood pressure.** American Journal Medical Sciences, February, 1912.

The author has recorded the maximum blood pressure in 59 men, 6 boys, and 32 young women at three periods relative to the time of taking exercise; namely, just before, immediately after, and then a little later, after a short rest or the usual bath. In addition, he made observations on 29 men at the first two times mentioned.

The individuals observed were engaged in sedentary occupations, and the exercise was taken as a recreative, hygienic measure, and consisted for the most part of the well-known class of work, done to music, embracing pulley weights, free-hand, dumb-bell, bar-bell, and Indian-club exercises, marching, dancing, deep breathing, and finally a sharp run, lasting altogether from a half to three-quarters of an hour. His idea was to observe the effect of moderate, comparatively mild exercise, or of a short, sharp effort.

From his observations the author concludes that in every case exercise produces rise in systolic blood pressure, the maximum occurring, sometimes, during the effort. As fatigue sets in and advances, the pressure falls to normal or subnormal. If the exercise ceases at a time when the increased pressure exists, the return to normal takes place rapidly, generally within a comparatively few minutes. Or, if it ceases after the fall to subnormal has occurred, then the return upward to normal is slower, depending upon the degree of fatigue or exhaustion. He quotes Lowsley as follows:

A maximum systolic pressure is reached more rapidly in the case of a fatigued individual, but is not nearly so extensive. When the subnormal phase returns to normal within 60 minutes the exercise may be considered as lying well within hygienic limits for that individual; while a return to normal delayed beyond 120 minutes may be regarded as exceeding these limits.

The author represents the various phases of blood pressure before, during, and after exercise by a double curve: Starting from the normal and rising to the maximum at a greater or less height; remaining there for a greater or less time, according to the strength of the individual for sustained work, his condition of freshness or fatigue, and his degree of training; then as fatigue begins and increases, falling and continuing to fall until the normal is passed and the subnormal point

is reached; and, finally, after cessation of exercise and rest, a return, more or less rapidly, depending upon the degree of fatigue, to normal again.

Lowsley states that "rapid exercises (vigorous, fatiguing, exhaustive) are followed by a fall of pressure below normal, which lasts longer than after moderate exercise, even if the former is continued for a very short period, and the latter for quite a long period of time; furthermore, the return to normal pressure after the subnormal phase is slower the more exhausting the exercise." The author finds, on the other hand, that after a short period of mild or moderately severe exercise, as in class work, the blood pressure taken immediately at the conclusion of the exercise shows in the majority of cases a rise, followed quickly by a fall to or near normal, or to subnormal. Exceptional cases may indicate that either the exercise is too severe or taken in an exhausted condition, or that the individual is so well trained that the blood pressure is little influenced.—(J. L. N.)

BRILL, N. E., A. M., M. D. **On the identity of typhus fever and Brill's disease.**
Medical Record, New York, June 1, 1912.

In this article Dr. Brill (whose name has become generally well known through his presentation to the medical profession of the symptom complex termed "Brill's disease") offers a word of warning against a too hasty acceptance of the conclusions reached by Drs. Anderson and Goldberger¹ to the effect that "Brill's disease" and typhus fever are identical.

He states that, "If Drs. Anderson and Goldberger had gone no further than to say that they had proved a definite relationship between these diseases to be established, no issue could have been taken with their conclusions. But there is a great difference between kinship and identity of disease." For example, we are justified in saying that there is a relationship between typhoid fever and paratyphoid fever, but no one claims that they are identical, "because they differ clinically and the organisms which are the respective etiological factors productive of the respective diseases, while related organisms, show biological and cultural differences sufficient to differentiate them."

Since it has previously been held that immunity against a disease could be established by such specific disease and no other, the author feels that it was logical for these investigators to reach the conclusions that they did, but that the work of Metchnikoff and Besredka (*Recherches sur la fièvre typhoïde expérimentale*, par. E. Metchnikoff et A. Besredka, *Annales de l'Institut Pasteur*, No. 3, p. 193, March, 1911) has discomfited our attitude toward the question of

¹ Anderson, J. F., director, hygienic laboratory, and Joseph Goldberger, passed assistant surgeon, United States Public Health and Marine-Hospital Service. "The relation of so-called Brill's disease to typhus fever." *Public Health Reports*, Feb. 2, 1912. (Reviewed in *Naval Medical Bulletin*, April, 1912.)

specific immunity and thereby rendered the work of Drs. Anderson and Goldberger uncertain in the premises.

The author goes on to say, "Metchnikoff and Besredka have proved, however, that chimpanzees immunized against paratyphoid fever are immune to typhoid fever inoculation. In the light of the masterful experimental results of these brilliant investigations, are we justified in concluding that on account of the immunity of chimpanzees so inoculated typhoid fever and paratyphoid fever are identical? The same reasoning will apply with equal force to Brill's disease and Mexican typhus fever.

"Clinically and empirically we have an analogous condition in vaccinia and variola as they occur in man. While it is possible that vaccinia is a variola modified by bovine transmission, or what is even more remote, if possible, that variola is a vaccinia modified by human transmission, nobody believes that these two infections are identical. Yet inoculation with vaccinia immunizes the individual against variola."

He feels that it is premature to speak conclusively about the identity of the diseases with such marked differences as typhus fever and Brill's disease before anything is definitely known about their causative agents.—(J. L. N.)

GOLDBERGER, JOSEPH, passed assistant surgeon, and ANDERSON, J. F., director hygienic laboratory, Public Health and Marine-Hospital Service. **Studies on the virus of typhus.** Public Health Reports, May 31, 1912.

The authors have carefully reviewed the literature bearing upon and the experimental work performed relative to the determination of the nature of the virus of typhus fever, and have themselves carried out certain experiments with rhesus monkeys in an effort to reach exact conclusions.

Their studies were taken up under six main divisions:

1. Duration of the infectivity of the blood.
2. The seat of the virus of typhus.
 - (a) Comparative virulence of the various elements of the blood separated by centrifugation.
 - (b) Nonvirulence of blood serum freed of its cellular elements by centrifugation.
 - (c) Nonvirulence of the cerebrospinal fluid.
3. Filterability.
 - (a) Virus in the blood.
 - (b) Virus in the louse.
4. Effects of drying.
5. Effects of heat.
6. Effects of freezing.

The summary of their work and the conclusions reached are given in full.

1. The literature bearing on the duration of the infectivity of the blood is critically reviewed. Two experiments are reported, and the following conclusions are drawn:

- (a) The blood of the monkey infected with typhus may be virulent in the prefebrile stage, but no satisfactory evidence of that fact has as yet been adduced.
- (b) The blood of the monkey may still be virulent 24 to 32 hours after the return of the temperature to normal.

2. The literature bearing on the question of the localization of the virus is critically reviewed, and it is pointed out that the evidence adduced by Nicolle, Conr, and Conseil, in support of their hypothesis of an intraleucocytic localization, is not valid. New experiments are detailed, and the following conclusions are drawn:

- (a) The available evidence favors the view that the typhus virus is extracellular and free in the circulating plasma.
- (b) The serum of virulent typhus blood is constantly infective whether obtained from defibrinated blood or after clotting, instances of its apparent avirulence being explicable by a natural resistance of the monkey.
- (c) It may perhaps be possible to deprive typhus blood serum of its virulence by prolonged centrifugation; but this does not necessarily indicate an intraleucocytic localization of the virus.
- (d) Repeated (three) washings of the blood corpuscles does not deprive them of their infectivity.

3. The literature bearing on the question of the filterability of the typhus virus is critically reviewed. It is found that eight attempts have been recorded to pass the virus through the Berkefeld filter. Of these, six were clearly negative; in one of the other two, the monkey, without giving any evidence of a reaction to the inoculation, was later found to be resistant to an immunity test; in the other, one of a pair of monkeys is described as having presented a doubtful reaction to the inoculation and later was found resistant to a single immunity test.

New filtration experiments are reported, but in no instance was infection produced; when submitted to an immunity test, two of seven monkeys at first appeared to be resistant, but later, when the test was repeated, both responded.

The conclusion is drawn that there is no evidence to show that the virus in the blood of typhus is able to pass the Berkefeld filter; and, incidentally, that virulent typhus blood contains no toxin, or that it contains it in quantities too small to cause an appreciable increase in the normal resistance of the monkey when injected, even repeatedly, in the doses ordinarily employed for inoculating the monkey.

Two attempts are recorded to filter the virus as it exists in the body of the louse; in one, the monkey inoculated with the filtrate, without giving any indications of a reaction, was subsequently found refractory to repeated immunity tests, suggesting that he had been vaccinated by the filtrate. While this seems to point to the existence of a filterable phase in the body of the louse, it can not be regarded as conclusive without further corroborative work.

4. The resistance of the virus to drying is tested in two experiments with results indicating that the virus is deprived of virulence at the end of 25 hours.

5. The literature bearing on the resistance of the virus to heat is critically reviewed. The results recorded are summarized, some new experiments detailed, and the following conclusions drawn:

- (a) The virus may (perhaps generally does) retain its virulence after heating at 50° for 40 minutes.
- (b) The virus is deprived of virulence (? killed) by heating at 55° for 15 minutes.
- (c) The virus is probably deprived of virulence (? killed) by heating at 60° for 5 minutes.
- (d) The virus is probably deprived of virulence (? killed) by heating at 55° for 5 minutes.

6. The resistance of the virus to freezing (0° C.) is tested. It is found that it may retain its infectivity, after freezing (0° C.), for at least 8 days.—(J. L. N.)

SURGERY.

Surg. R. SPEAR and Surg. C. M. OMAN, United States Navy.

Judd, E. S., M. D. **The prevention and treatment of ventral hernia.** Surgery, Gynecology, and Obstetrics, February, 1912.

In this article attention is called to various methods of closing abdominal wounds which are used in the St. Mary's Hospital, Rochester, Minn., and which have been found to minimize the frequency of postoperative ventral hernia. It is true that postoperative ventral hernia is a secondary consideration, and often unavoidable, following a severe and extensive abdominal operation, but it is likewise true that many times this condition can be prevented by the proper choice of and manner of closing the primary incision.

Infection is the chief cause of hernias which occur in operative wounds. The giving way of a wound which was healed by primary intention is seldom seen, yet the few instances in which it does occur are altogether too frequent.

Many times one is tempted to remove an adherent appendix through a right rectus incision which was made primarily for a gall-bladder operation, but in so doing, one is obliged to continue the rectus incision several inches downward, severing one or more of the important nerves, which may cause the muscles to atrophy and thus allow a hernia to develop. A separate split-muscle incision for appendectomy is a wiser procedure.

In performing pelvic operations open the sheaths of both recti muscles and close the incision by bringing the muscles and their sheaths, respectively, together in the midline. This is far better than going through the midline, where, in the closure, one would have a thin, firm, slow-healing fascia; or, if the incision were made just to one side, the fascia alone, or the fascia with a small strip of rectus muscle in it, would not have a good healing power.

An incision through the aponeurosis of the external oblique can be closed with a better degree of strength if the aponeurosis be imbricated. The aponeurosis is thin, firm, and white, in the region of a McBurney incision and the two edges sewn together will seldom heal. While this does not necessarily produce a hernia, it does allow the aponeurotic flaps to retract and the edges to separate, making a broad, flat, unsightly scar, which can be avoided by overlapping the aponeurotic flaps face-to-face.

Under no circumstances should a split-muscle incision be enlarged by cutting across the fibers of the internal oblique muscle. If the appendix be adherent toward the midline and the exposure is inadequate, extend the incision through the external oblique muscle into the sheath of the rectus, not cutting the muscle fibers. Occa-

sionally, the separation of the internal oblique fibers will be at a point too low for the removal of a high-lying appendix, or a cystic ovary or infected tube may be palpated just out of reach of the incision. The proper procedure in these instances is to extend the incision in the external oblique muscle and make a new separation of the internal oblique fibers, either high up or low down.

The following incision is recommended in suprapubic operations on the bladder. Use a transverse incision at a point about an inch and a half above the pubic bone. The sheaths of the recti muscles are cut transversely and dissected off from the bodies of the muscles an inch and a half each way. The muscles are then separated in the midline, but none of the fibers are cut. When the operation is completed, the muscles are allowed to drop together, and the cut edges of the sheaths are united by sutures.

In treating ventral hernias it must be remembered that the mere fact that the hernia exists means that there has been a sloughing away or atrophy of a part of some one or all of the anatomic layers, and for this reason the anatomic closure should not be considered. The method of removing all of the scar tissue and closing the gap in the abdominal wall by approximating the various anatomic layers gives a high percentage of recurrences, and a mortality which, in all probability, is due to the sudden and marked increase of the intra-abdominal pressure caused by the reduction of the hernia and the diminution of the abdominal circumference by closure under external tension.

If the ventral hernia is in a fleshy person, two to six weeks should be devoted, if necessary, in preparation for operation, which consists in reducing the weight, getting rid of the excessive fat, and having the patient spend several hours each day in reducing or attempting to reduce the hernia. At times this may be accomplished by elevating the foot of the bed.

The rapidity and strength with which the peritoneum heals is illustrated by the following examples: (a) It is well known how difficult it is to drain the general abdominal cavity, because the foreign substance introduced is very quickly walled off by the union of the peritoneal coats of the abdominal organs. (b) An incision through the peritoneal surface of the bladder will invariably close up without leakage, although a suprapubic incision not through the peritoneum, though carefully sutured, will frequently drain urine for a time. (c) It is not necessary to sew the gall bladder to the peritoneum when doing a cholecystotomy in order to prevent the leakage of bile when the drain is removed. The gall bladder, with the tube stitched in it, is simply allowed to drop back, as we know it will soon be surrounded by adhesions of the rapidly healing

peritoneum, and in case the tube should come out, a complete sinus is present from the gall bladder to the skin.

The Mayos have taken advantage of this marked reparative power of the peritoneum in operating on ventral hernias. Instead of trying to dissect the peritoneum from the other tissues, and thereby usually buttonholing the flaps in several places, they simply make the autoplasmic flap of peritoneum, muscle, fascia, and scar tissue, as the case may be, and overlap all of these layers as one flap onto a similar flap of the opposite side. In this way the peritoneum of one flap is approximated to the aponeurosis and scar tissue of the other flap. The overlapping may be from side to side, from above down with either flap outside, or it may be placed obliquely. This point can be determined after the hernial contents have been reduced and the flaps measured.

The steps of the operation are as follows:

- (1) Remove the old skin scar.
- (2) Clean the fat from the fascia for 2 inches in all directions.
- (3) Dissect the neck of the sac free from the aponeurosis.
- (4) Open the sac and free adhesions for at least 1 inch inside the hernial opening. Under no circumstances sacrifice any of the scar tissue or excessive tissue of any kind except the fat.
- (5) Make no attempt to separate the flaps into anatomic layers. Choose the most convenient way of overlapping the flaps one upon the other, the peritoneal surface of one flap lying on the aponeurosis of the other. Mattress sutures of linen or chromic catgut are passed through the pedicle of one flap and the free edge of the opposite flap. The peritoneal surface at the pedicle of the overlapping flap is then stitched accurately to the opposite flap.
- (6) The free flap is now allowed to drop on to the aponeurosis of the opposite flap and is stitched accurately in place. Very careful hemostasis is most essential. In case there is any serum or a great deal of fat it is best to drain either through the end or through a stab drain.

In the ordinary case 15 to 18 days in bed is ample time for healing. Don't wear any truss or bandage which will make direct pressure upon the wound area. If necessary a general abdominal binder which does not make direct pressure at any point may be used. It is believed that any appliance making direct pressure not only will not prevent a recurrence, but instead it will have a tendency to push apart the flaps which have been imbricated and also, by pressure, interfere with proper circulation and healing of the tissues.—
(C. M. O.)

CARREL, ALEXIS, M. D. **Technique and remote results of vascular Anastomoses.**
Surgery, Gynecology, and Obstetrics, March, 1912.

The author states in his introduction that the method of vascular anastomosis to be described came into existence nine years ago from the study of the technique of Payr and of Murphy. Its principle was worked out on human cadavers and on two living dogs at the University of Lyons. The technique has improved and has been slightly modified, and through many experiments, chiefly at the Rockefeller Institute for Medical Research, the causes of all possible complications were analysed and adequate procedures developed in order to prevent their occurrence.

Certain general rules have been adopted with the view to eliminate stenosis hemorrhage and thrombosis.

A rigid asepsis is absolutely essential. Sutures of blood vessels must never be performed in infected wounds. Slight nonsuppurative infection, which does not prevent the union of tissues, may cause thrombosis.

Thrombosis follows injuries of the wall of the vessel. The arterics and the veins can be freely handled with the fingers without being injured, provided the wall is not crushed with forceps or other instruments. If a forceps be used, it must take between its jaws nothing but the external sheath. When obtaining hemostasis by means of forceps or clamps, be sure they are smoothjawed and the pressure of the jaws carefully regulated.

As desiccation of the endothelium may lead to the formation of a thrombus, the wall of the vessels must be humidified during an operation with Ringer's solution, or covered with vaseline. It is necessary to resect or to remove the external sheath from the edges of the vessels, for, if during the suture, it gets between the edges of the vessels, or around the silk threads, it very quickly leads to a deposit of fibrin. The presence of coagulated blood, of fibrin ferment, or of foreign tissues or tissue juices on the interior can determine the production of a thrombus. By washing carefully the vessel with Ringer's solution and coating it and surrounding parts with vaseline we can sufficiently protect the endothelium. Vaseline also prevents the fingers of the operator and the threads from being soiled by fibrin ferment.

Extremely small and very sharp round needles are advocated. The silk threads are sterilized in vaseline and kept heavily coated with it during the suture.

Stenosis is very apt to occur at the point of anastomosis; therefore, the suture must be performed while the wall is under tension. The tension is obtained by traction on retaining stitches properly located. Care is taken to obtain a smooth union and approximation of the internal coats.

The following instruments are suggested by the writer: Crile clamps or elastic-jawed forceps when suturing an artery the size of the femoral. On smaller vessels use a small Crile clamp, made by Collins, or an ordinary serrefine. These forceps are smooth-jawed and are used without rubber. In the large vessels, the circulation can also be stopped by a narrow, rubber strip which is drawn tightly around the vessel and fixed by a strong serrefine or forceps. When the circulation can not be interrupted, intubation of the vessel is performed. A paraffined tube is introduced into the lumen and fixed at each end by a rubber band. Then it becomes possible to resect the wall without hæmorrhage while the circulation goes on through the lumen of the tube.

Washing of the vessel is performed with a Gentile syringe, which is composed of glass and of a rubber bulb.

The needles are round and straight, Kirby No. 12 and 16, depending upon size of the vessel. Handle needle with fingers. The silk thread is very fine and sterilized in vaseline. The needles are threaded and the thread is rolled on cardboard. Then needles and thread are placed in a hermetically closed jar, which is put in the sterilizer under 15 or 18 pounds pressure. The needles are removed from the pan while the vaseline is still warm and deposited on a black towel. The ends of the threads are fixed during the suture by very small Gentile hemostatic forceps.

In brief the operation is described as follows: Expose vessels by a large incision and freely dissect them. Secure careful hemostasis of the wound. Place the clamps, forceps, or rubber bands a few centimeters from the seat of the future anastomosis. Ligate or clamp collaterals. Cut the vessels and resect the external sheath from the edges.

Introduce the end of the syringe into the lumen of the vessels and wash out all the blood both from the vessels and from the operating field. Cover vessels and surrounding parts with vaseline.

(a) Under the "termino-terminal anastomosis," arterial, venous, and arterio-venous anastomoses are described.

In the arterial anastomosis the ends of the arteries must come into contact without strong traction. First, three retaining stitches located in three equidistant points of the circumference are introduced. The needle perforates the arterial wall at a short distance from the edge and a first posterior thread is placed and tied. One end of this thread is fixed with a small forceps, while the other end with the needle is laid aside and will be used for the continuous suture. Then the remaining two retaining sutures are inserted and tied. By traction on the threads the circumference of the arteries can be transformed into a triangle. The edges of each side of the triangle are united by a continuous suture made with the posterior

needle. A few stitches only are necessary. In the case of an artery the size of the carotid of a middle-sized dog, three stitches are made on each side of the triangle. Great care is taken to approximate exactly the surfaces of section of the wall. Raw surfaces must not come in contact with the blood stream. Before the complete closing of the artery the vaseline is removed by pressure from its lumen.

In venous anastomosis the three retaining stitches are used, but more stitches to close the circumference are required. Approximate by eversion of the edges, and union is secured not by the surface of section but by their endothelial surfaces.

In arterio-venous anastomoses the vein is generally larger than the artery. By traction on the retaining stitches the arterial end can be much dilated and then each stitch of the continuous suture is made larger on the vein than on the artery. The venous wall is turned outward and its endothelial surface is applied against the surface of section of the arterial wall.

(b) The "termino-lateral anastomosis" consists in implanting the end of a vessel into the wall of another vessel. A triangular or elliptical opening is made through the wall of one vessel and the edges of the opening are approximated to the end of the other vessel by the aid of three or four retaining stitches and a continuous suture.

(c) In the "latero-lateral anastomosis," the vessels are placed near each other and opened longitudinally by incision or resection of an elliptical flap. The edges of the opening are then united in a manner quite similar to the methods described above.

Before the reestablishment of the circulation, examine the line of sutures carefully, and if a gap is found between the stitches, close it immediately by a stitch. Then place gauze sponges on the line of sutures, remove clamps, all the while making a gentle pressure with the sponges. There is usually a little leakage during the first minutes, but after two or three minutes the sponges are removed, and if some hemorrhage still persists, one or two complementary stitches are added. Wash the operating field again with Ringer's solution and close without drainage.

The article contains excellent photographs and illustrations demonstrating the technique.

Carrel states that the results of this operation are practically always positive. It has permitted the transplantation of venous segments to arteries, homoplastic and heteroplastic transplantation of blood vessels, transplantation of vessels in latent life, replantation and transplantation of spleen, thyroid glands, kidneys, limbs, etc.

Blood-vessel operations are easier on human beings than on dogs, and it seems that the results are as satisfactory.—(C. M. O.)

HUGHES; DAYTON: **Accidents and deaths from exploratory puncture of the pleura.**
Surgery, Gynecology, and Obstetrics. December, 1911.

The author concludes that in many accidents, which have been regarded as resulting from simple exploratory puncture of the pleura, the fatal outcome has been noted as the result of pneumothorax; puncture of a hydatid cyst; perforation of the diaphragm, stomach, liver, and spleen; hemorrhage from intercostal vessels or the lung and from pleural reflexes.

The records of about 20,000 consecutive admissions to the medical wards of the New York Hospital included: One case of breaking of the needle in the chest wall; 3 cases of subcutaneous emphysema; 1 of puncture of the apices of the lung followed by septic symptoms; 4 of hemoptysis; 1 of puncture of an aortic aneurism; 1 of syncope; and 1 of death after sudden onset of grave cerebral symptoms.

From the history of these cases and from a review of the literature, including 21 cases of pleural reflexes and excluding from consideration all accidents resulting from aspiration, it was seen that: (1) Breaking of the needle involves the danger of the presence of a foreign body. Its prevention demands only ordinary care and skill and restriction of movement of the patient. (2) Localized pleurisy can not be prevented, but the pain may be relieved by strapping or local applications of heat. (3) Subcutaneous emphysema is rarely productive of more than some discomfort and perhaps alarming appearances unless accompanied by cellulitis. It can not be prevented, but rarely requires treatment. As a complication of pneumothorax it may act as a safety valve, hastening the absorption of air. (4) Pneumothorax can not always be avoided. Its importance depends upon the physical condition and the site of the puncture, as regards the possibility of spontaneous closure of the puncture and the general condition of the patient. (5) Infection of the pleura from without may be prevented by aseptic technique and its occurrence is probably comparatively infrequent. That from foci and infection within the body cavity can not be avoided. If emphysema results the treatment is surgical. (6) Puncture of a hydatid cyst of the lung is a rare but serious accident. Radiographic examination might show a shadow whose rounded outline would suggest the presence of the cyst rather than of pleural effusion, and favor exploratory incision rather than puncture. (7) Puncture of the diaphragm with peritoneal infection from intrathoracic focus may sometimes be avoided by radiographic determination of the level of the diaphragm. (8) Prevention of perforation of the heart, stomach, liver, and spleen, with possible infection or hemorrhage, calls for reasonable care as to the site and depth of the puncture. Its occurrence, if results are serious, demands early diagnosis and immediate surgical treatment.

(9) Perforation of aneurism of the descending aorta submerged by fluid, as in one case recorded and giving no definite signs, can be avoided only by puncturing as far as possible from the median line. In the reported case this would have been beyond the posterior axillary line. (10) Hemorrhage from an abnormally placed intercostal vessel can not be foreseen. Sudden increase of pleural effusion, with symptoms of internal hemorrhage or profuse bleeding from the site of the puncture, requires immediate incision and ligation. Hemorrhage from the lung is shown, by a study of the 21 cases, to occur most often in cases of consolidation; 33½ per cent of these resulted in death. Unnecessary movement of the needle within the chest should be avoided. (11) Albuminous expectorations, which usually occur only after the withdrawal of the pleural effusion, have resulted from puncture, and are probably due to reflex vasomotor changes. (12) Pleural reflexes; cardiac or respiratory failure, convulsions, coma, paralysis, etc. These result from stimulation of branches of the vagus nerve, probably in the visceral pleura, but possibly in the lung. These accidents occur most often, at least 76 per cent, in cases with consolidation of the lung, usually due to a chronic inflammatory process.

The precautions in performing exploratory puncture of the pleura, which analysis of 23 cases of accidents due to pleural reflexes suggests, are, (1) Avoid moving a patient with pneumonia or pleurisy with effusion, especially from the recumbent to the sitting posture. (2) Avoid turning him on the sound side. (3) Avoid excitement before the operation. (4) Use as small a needle as will suffice and avoid all unnecessary shock, as this is badly borne by cases of pneumonia. A small trocar inserted through a skin incision may be safer than a needle, as it is less likely to lacerate the visceral pleura and lung. It should be introduced only far enough to obtain the fluid. (5) Never use an exploring needle as a labor-saving device if a careful study of the physical signs will suffice. (6) Puncture cases with probable consolidation only when a definite indication for diagnosis or treatment exists, *e. g.*, the probable presence of pus is shown by temperature curve, and increasing polymorphonuclear leucocytosis or extreme and increasing signs of fluid indicated by displacement of apex beat or by respiratory embarrassment. In cases beginning as definite lobar pneumonia it is often more conservative to wait until after the crisis before exploring, unless the symptoms suggest the necessity for early operation if pus should be found. In such cases rapid resolution may remove the signs which simulate fluid. If the signs are such, however, as to prevent clear diagnosis of the intrathoracic lesion, and empyema is suspected, explore without delay, especially in children. More lives are probably lost by delayed diagnosis of empyema than by all the accidents due to exploratory puncture of the pleura.—(C. M. O.)

EASTMAN, Dr. JOSEPH KILUS. **The control of bleeding in brain operations.** American Journal of Surgery, January, 1912.

The author believes that the loss of large quantities of blood combined with other depressing features incident to long brain operations may determine the occurrence of alarming symptoms or even death.

In all operations upon the head, position is an important factor. Hemorrhage can be decreased notably by maintaining the head at such elevation that the field of operation is higher than the patient's trunk. Experience has doubtless taught most surgeons that the head-hanging position or even the horizontal position will increase the bleeding and increase the danger to the patient, as well as the technical difficulties of the operation.

The author remarks that a constriction band along Reid's baseline before craniotomy is not always justified. The increase of venous hemorrhage, owing to the presence of the elastic band is greater than the decrease of arterial hemorrhage which results from constriction. In brain tumor, when considering the large sinuses, the venous engorgement may be communicated to the diploe and to the scalp veins through the median and numerous emissary veins to the skull, and in such cases a tourniquet is of doubtful usefulness. The elevated position will usually do more to check such venous hemorrhage than the elastic encircling band.

The author remarks that one or two broad, rubber, circular bands of the common stationery kind may be snapped on and off more conveniently than rubber tape or an Esmarch bandage. In order to bring greater pressure to bear where it is needed, the placing of gauze pads under the rubber band and over the temporal, posterior auricular, and occipital, or other large scalp arteries may be practiced. The bleeding from a scalp flap whose base is not excessively broad may be controlled readily by catching the base of the flap between the jaws of rubber-covered forceps.

Hemorrhage from the diploe usually requires no special attention, but if this bony structure be extensively developed and highly vascularized hemorrhage from its gaping canals may be very annoying or even alarming. Pressing Horsley's wax into the openings of the diploe may suffice to control this bleeding, or warm, soft, sterile gum chicle may be pressed into the opening. This chicle is considered more tenacious than the wax, but it is not absorbable and must be removed before the closing of the wound.

In many cases threatening hemorrhage from a large canal of the diploe has been controlled by inserting into the opening from which the blood was streaming the pointed or conical end of a previously boiled soft pine toothpick. Foramina connecting with intracranial

sinuses can be closed in this manner. This small piece of wood should be removed after coagulum has formed.

The writer states that for several years he has used a punch-like instrument for the purpose of tamping or condensing the diploe, in order to thus control hemorrhage from within the structure. The crushing of the exposed ring of diploe with this instrument has proved of considerable service.—(C. M. O.)

BINNIE, J. F. **Surgical pathology of the stomach and duodenum.** *Journal of Surgery, Obstetrics, and Gynecology*, June, 1912.

The arrangement of the portal venous system is of great importance in consideration of lesions of the stomach. A network of venous capillaries exists around the mouths of the tubules of the gastric glands and these veins then go vertically through the mucosa to the submucosa and there form a wide venous plexus. The blood is gradually gathered together and all goes to the liver by means of the portal vein. The blood before it reaches the liver naturally is full of infective material but becomes purified in the liver. Whenever an excess of infective material is absorbed and excreted by the bile there is a possibility of gallstone formation. The stomach is not very vulnerable to trauma; areas of mucosa can be excised and rapid healing follow; foreign bodies many times cause no disturbance.

It is well known that extensive burns of any part of the body may be followed by an acute ulceration of the duodenum. Pfeiffer obtained from the organs of burned animals a poison that when injected into healthy animals caused gastric ulcer. In his opinion the poison injured the gastric and intestinal vessels to such an extent that there was an effusion of blood in the mucosa and the gastrointestinal juices digested the injured parts.

Toxemias due to sepsis-cholemia are capable of producing ulceration. It is believed that many toxins are eliminated by the stomach and that the acid gastric juices lower the vitality of the vessels. This is shown by the development of peptic ulcers in the jejunum after gastro-enterostomy.

In 1908 Bolton made elaborate experiments with a substance he termed gastrototoxin. This was derived by injecting an emulsion of guinea pig stomach into the peritoneum of rabbits. Gastric ulcers could be produced in the guinea pigs by injection of this serum either into the stomach mucosa or into the peritoneal cavity. The ulcers were influenced by the acidity of the gastric juice. When the gastric juice was neutralized the ulcers healed rapidly.

Zironi divided both vagi, subdiaphragmatically, in rabbits and produced gastric ulcers in 64 per cent of the animals experimented upon.

Retrograde embolism can occur. A clot can form in the terminal gastric veins. An area is deprived of circulation and the acid juices eat into the tissue and an ulcer forms.

The writer is of the opinion that we should look at the sewage system for a supply of a constant irritant. Paterson, Moynihan, and the Mayos have pointed out the association in a large per cent of cases of gastric or duodenal ulcers with a diseased appendix.

Binnie believes that 70 per cent of gastric carcinomas originated from a preexisting ulcer. The explanation of the rarity of carcinoma of the duodenum and frequency of ulcer is probably due to the fact that the acid contents of the stomach may conduce to cancer; the alkaline contents may have the opposite effect and the stomach is more exposed to mechanical irritation from badly masticated and improper foods.—(R. S.)

HYGIENE AND SANITATION.

Medical Director H. G. BEYER and Surg. C. N. FISKE, United States Navy.

HILL, LEONARD E.; FLACK, MARTIN. *The physiological influence of ozone*. Proceedings Royal Society, 1911, B. 84, pp. 404-405.

The authors draw conclusions, markedly divergent from the claims of the makers of ozonators, as follows: Ozone, though a deodorizer masks rather than destroys smells. A concentration of one part in ten million irritates the respiratory tract; exposure for two hours to a concentration of fifteen to twenty per million is not without risk to life. In concentration of even less than one per million it reduces respiratory metabolism, and rapidly causes a fall of body temperature. Its beneficial effect, as popularly believed in is a myth. The irritation of the olfactory nerves may relieve the monotony of close air, and in concentration of more than one part per million for a brief period may be of therapeutic value by acting in appropriate cases as a sort of "blister" to the respiratory tract.—(PASSED ASST. SURG. E. W. BROWN, U. S. NAVY.)

[Ed.—The following is of interest in connection with the above expression of opinion.]

Annotations. *Ozonized air in tube railways*. London Lancet, May 18, 1912.

The supply of ozonized air in the Central London Tube Railway is an accomplished fact, and there can be little doubt that the system adopted (ozonair) is so far giving satisfactory and agreeable results. It was found that the mere pumping of large volumes of ordinary air into the tube did not deal with that "tube frowsiness" which is familiar not only to travelers on the line but to anybody who happens to be in the neighborhood of a lift just discharging its passengers in the street. However chemically satisfactory air may be shown to be, the merest trace of offensive smell renders it unfit for healthy respiration. There may be present a maximum of oxygen and a minimum of carbonic acid gas, but still the air may remain unhealthy on at least three counts. It must be free from disagreeable smell, it must be in motion, it must be reasonably humid. These conditions appear now to be complied with by the use of a constant stream of air, washed, screened, and mildly ozonized. In the Central London Railway the air is stated to contain rather less than one part of ozone in a million parts of air, and yet the presence of this gas is perceptible, not so much as an odor as by the agreeable fresh character which its presence gives to the air. The

employment of ozone probably suffices to remove those organic impurities which render the air stale, flat, and unprofitable. Ozonized air, in fact, as was pointed out by Dr. Leonard Hill, relieves the depressing effect which air tainted by foul odors has upon the nervous system. It will be interesting to watch the progress of this big experiment, and we understand that it has already given great satisfaction to the employ es on the line, who speak of the obvious relief from stuffiness and objectionable odor which has resulted since the installation was started. The whole of the plant and machinery is operated by the same electric current which is used to work the trains, and the ozone generator is of a special type which does nothing more than condense a very small part of the oxygen of the air into pure ozone.

LEHMANN, K. B.; WISSENBERG, R.; VON WOJCIECHONSKI, A.; LING and GENDERMANN. **The influence of benzine, toluene, xylene, and light and heavy "benzines" on the organism.** Arch. Hyg., 1911, Bd. 75, pp. 1-119.

(This research is deemed of special service interest in view of the not infrequent cases of poisoning from gasoline on submarine boats.)

A short account of the various products employed under different trade designations is given, together with the modes of preparation and chemical characteristics. Detailed accounts are also given of the cases of poisoning arising from the trade use on a large scale of the different products and the conditions under which cases of poisoning are liable to occur, together with the results of personal inspection of factories. These studies supplement a series of detailed laboratory investigations on the toxic effect of the vapors of the various substances on cats, dogs, and men; and the effects of both chronic and acute intoxication were investigated. Lehmann gives, in conclusion, the precautions which should be taken to guard against poisoning in the technical use of these substances on a large scale.

The methods of experiment were those repeatedly employed by Lehmann and his colleagues on previous occasions. The subjects of experiment were submitted to the action of air containing known quantities of the vapor and the time was noted at which the onset of various symptoms took place. The chief effects noted were the falling over of the subject, light narcosis, and heavy narcosis. In nearly all of the experiments the results were very regular, it being possible to plot the times of onset of symptoms against quantities of the various vapors in air and to obtain almost regular curves. A few of the cats employed showed idiosyncracies in that they were susceptible to relatively small doses of benzine. The same idiosyncracies apparently occur in man, but they were never met with in the case of dogs. Experiments in chronic poisoning with dogs were carried out. Two of these animals could inhale air containing about 9 milligrams of the vapor per liter for 5 to 9 hours daily for 23 days without injurious effects. Cats, on the other hand, showed symptoms of poisoning after inhaling air with only 5 to 10 milligrams benzine per liter for 3 hours daily, generally on the third to the sixth day. The cheaper trade varieties are only slightly more toxic than the refined products.—(E. W. B.)

NEUMARK, Dr. E. **Desinfektionsversuche mit Perautan und Paragan.** (Disinfection experiments with Perautan and Paragan. Hyg. Rundschau, Jahrgang XXII, Berlin, May 1, 1912, Mo. 9, p. 549.

Last year two new preparations, namely, "Perautan" and "Paragan," appeared in the market, both of which possess, in equal proportions, the merit of having simplified the method of disinfection with paraform and permanganate without apparatus.

Parautan (Fr. Bayer & Co., Elberfeld) comes into the market in the form of packages of various sizes, made up of tin cases, in which are contained (1) a paper package of paraform and (2) a paper package of potassium permanganate. The accompanying directions require that the contents of the paraform package shall first be emptied into a bucket which must possess the capacity of one-third in number of liters as the space to be disinfected has cubic meters. To this white powder (paraform) in the bucket is now added enough water of the temperature of 20° C. as will fill the tin case up to a given mark. The mixture is then stirred up thoroughly with a stick until the powder is wet through. Upon the resulting thin paste is now emptied the contents of package 2, the permanganate of potash. This mixture is again thoroughly stirred up, after which the operator leaves the room, closes its door air tight, and leaves its contents exposed to the developing gas for the period of five to seven hours.

The Paragan (E. Schering, Berlin) consists practically of the same ingredients. The directions differ but slightly from those given for the Perautan, inasmuch as here the paraform and permanganate crystals are mixed together before the water is added. With Paragan an exposure of four hours is insisted upon.

Both these preparations contain the chemicals in the proportions of 10 of paraform to 25 parts of potassium permanganate, as required by Kalähne u. Strunk and by Lockemann u. Croner, and which are to be mixed with 25 to 30 parts of water. For 1 cubic meter of room space 10 grams of paraform are required.

These preparations were tested by Neumark and his experiments and observations were attended by the most satisfactory results. Perautan produced within three hours a complete disinfection. Neumark even states that a package marked as sufficient for a room of 40 cubic meters' capacity will sterilize all the test objects in a room of 60 cubic meters' capacity. Disinfection with Paragan proved equally satisfactory.

In these new preparations, therefore, and in their ready application according to the directions accompanying them, Neumann sees for the first time disinfection accomplished without apparatus as effectively as with apparatus.—(H. G. B.)

MÜLLER, PAUL TH., Prof. (Univ. Graz). **Über eine neue, rasch arbeitende Methode der bakteriologischen Wasseruntersuchung und ihre Anwendung auf die Prüfung von Brunnen und Filterwerken.** (A new and rapid method of bacteriological water examination, its applicability to the testing of filtered and well water.) Arch. f. Hygiene, Bd. 75, Heft 4 u. 5, p. 189.

The method of bacteriological water analysis ordinarily employed is that of the gelatine-plate method, and which consumes about 48 hours. There are many excellent reasons why a more ready method would be more acceptable. A direct count of the bacteria, for instance, if such a method could be devised, would do away with the necessity of waiting for the development of colonies and, thus, give results in a much shorter time. While various attempts to devise such a method have indeed been made in the past, none of them appears to have been carried to so satisfactory a conclusion as has the method outlined by Paul Th. Müller and of which a brief account will here be given.

This method, briefly described, is about as follows: 100 c. c. of the water to be examined are transferred into a narrow measuring-glass cylinder and mixed with 5 c. c. of formalin to prevent an increase in the number of germs during sedimentation; 5 drops of liquor ferri oxychlorati are now added to the mixture and thoroughly mixed with the fluid by blowing through it a brisk current of air; after half an hour's standing the resulting precipitate will have settled to the bottom of the cylinder, the supernatant fluid is removed and the precipitate is mixed with 5 drops of a concentrated alcoholic solution of gentian-violet. The stained precipitate is now transferred to a centrifuge tube and afterwards exposed for one-half to one minute to a bath of boiling water.

A very fine pipette, divided into $\frac{1}{100}$ c. c. is now used to transfer a measured amount of the precipitate onto the object glass, on which a square centimeter has been marked off with the point of a fluoridic acid pencil. Careful heating over the flame fixes the precipitate on the object glass and a drop of oil of cedar is spread over it, allowing it to be examined with an oil-immersion lens and without the intervention of a cover glass. The bacteria then appear sharply marked off and distinctly stained on a yellowish brown bottom formed by the iron precipitate.

In counting, a Zeiss $\frac{1}{8}$ oil immersion lens, with a No. 2 eyepiece, is used and the tube is so arranged as to make the diameter of one of the visual fields measure exactly 0.25 mm., which is easily done by the aid of an object micrometer. After counting off 35-40 fields, the average contents of one of the fields is calculated.

The further calculation of the number of bacteria contained in 1 c. c. of water is done as follows: Since the diameter of one of the fields measures exactly 0.25 mm. its size is 0.05 square mm. or 0.0005

square cm.; since, furthermore, the total surface covered by our precipitate is 1 square cm., it includes $\frac{1}{1000}$ fields. If, therefore, we call "a" the number of bacteria counted in one field, the entire surface must contain about $\frac{1}{1000}$ bacteria. But this surface was covered with 0.02 c. c. of the precipitate and which had an exact volume of 1 c. c.; $\frac{1}{50}$ is consequently the number of bacteria contained in the total quantity of water examined and $\frac{1}{50} \times 1000$ equals the number of germs that is contained in 1 c. c. of water = a. 1,000. The calculation is reduced to a simple multiplication of the average number of bacteria in one of the visual fields by 1,000, in order to find the number of germs contained in 1 c. c. of the water examined.

For an accurate estimate some further precautions, as regards the instruments used; must necessarily be observed for the details of which we must refer the reader to the original paper. It must suffice here to add the simple statement, made by the author of the method, namely, that all the necessary operations, from the precipitation of the water by the solution of iron to the counting of the bacteria on the object glass, require less than one hour's time.—(H. G. B.)

DARLING, S. T. A mosquito larvacide-disinfectant and the methods of its standardization. American Journal Public Health, Vol. II, No. 2, February, 1912.

The monthly use of 250 barrels of larvacide requires one to be inexpensive, highly larvacidal and germicidal, readily miscible with water, and of uniform composition. These postulates are met by that described below, which was worked out by J. E. Jacob, chemist, board of health laboratory, Isthmian Canal Commission, and has been manufactured in the commission plant for over two years:

One hundred and fifty gallons of crude carbolic acid are heated in an iron tank having a steam coil with steam at 50 pounds pressure. Two hundred pounds of finely crushed and sifted rosin are dissolved in the heated acid, and then 30 pounds of caustic soda dissolved in 6 gallons of water are added. There is a mechanical stirring rod attached to the tank. The product is ready in a few minutes, yielding about $3\frac{1}{2}$ barrels. Cost of manufacture, August, 1909, per gallon, \$0.1413. The germicidal value when tested with *B. typhosus* in an aqueous emulsion of the larvacide has an R+D coefficient of from 2 to 5.

As a mosquito larvacide it is used by spraying an aqueous emulsion (1 part of larvacide to 5 of water) over the surface and along the margins of pools and ponds or other mosquito-breeding places [once every seven days], so that the resulting dilution of the larvacide has a thin, milky opalescence, representing approximately a dilution of 1 to 5,000.

Darling believes that the demonstrated germicidal superiority of emulsions through absorption of ultra-microscopic globules showing Brownian motion and bombardment applies to this emulsion as a larvacide.—(C. N. F.)

WHITTAKER, H. A., and MOHLER, B. M. The sterilization of milk bottles with calcium hypochlorite. American Journal Public Health, Vol. II, No. 4, April, 1912.

Experiments made by the laboratory division of Minnesota State Board of Health at small dairies where steam sterilizing apparatus could not be used economically showed that distilled water shaken in 138 bottles (from eight dairies) as usually washed with brush in sodium carbonate solution and rinsed in well or river water, when plated on agar, showed from 30 to 1,600,000 bacteria and an average of 120,000 per bottle.

After submerging those same bottles in calcium hypochlorite solution and similar plating, the colonies ranged from 0 to 540 and averaged 45 per bottle.

Over 99.9 per cent of the bacteria are thus removed by treating the bottles for 20 minutes with calcium hypochlorite solution in strength not exceeding 10 parts of available chlorine per million. Ninety-five per cent of the organisms remaining after this treatment were found to be spore bearers.—(C. N. F.)

STAMMERS, G. E. F., major, R. A. M. C., and DAVYS, G. I., I. M. S. Apyrexial malaria carriers. Journal Royal Army Medical Corps, Vol. XVIII, No. 3, March, 1912.

Out of 957 men of Second Battalion, Royal Irish Fusiliers, who had arrived at Quetta from malaria-infested Ferozepur nine months previously, were found 124 carriers of malaria organisms, although "in many instances no history of previous malarial attacks could be elicited," and the carriers were performing their full military duty. Fresh cases were continually appearing in this battalion, although the Second Royal Welsh Fusiliers, in barracks close by and who had five months more recently arrived from noninfected districts, suffered no more than usual. Explanation of this last fact was found in the extreme domesticity of the prevalent *Neocellia Stephensi*, no other Anophelines being present. Quinine prophylaxis (15 grains twice weekly on two successive days) greatly reduced fresh infections, but was without effect on the carriers in whom were found malignant tertian 39, benign tertian 84, and quartan 1.—(C. N. F.)

TROPICAL MEDICINE.

Medical Inspector E. R. SMITH, United States Navy.

LEISHMAN, Sir WILLIAM B. Cell-inclusions in the blood of a case of black-water fever. Journal of the Royal Army Medical Corps, May, 1912.

The author discusses the subject of our present knowledge of the *Chlamydozoa*, and notes certain characteristics of these protozoal organisms: (1) Their being capable of passing through the usual

bacterial filters, and (2) the occurrence of "cell-inclusions" in the diseases in which they are thought to be concerned. The list of such diseases, according to Prowazek, included smallpox, vaccinia, rabies, trachoma, molluscum contagiosum, contagious epithelioma of birds, foot-and-mouth diseases, and certain diseases of fish, dogs, and silk-worms. At present the list is limited to variola, vaccinia, trachoma, molluscum contagiosum, and bird epithelioma.

While these cell-inclusions are nonparasitic, they are to be looked upon as specific in the sense of diagnostic value, although probably mere products of cellular reaction to an unseen and unknown virus.

The discovery of minute granules in some of these diseases, in particular trachoma and variola, leads to the probability of these minute granules being the veritable causes of the diseases in question. The suggested life history of these organisms, which Prowazek considers of protozoal nature, is that a small granule gains access to a cell—a conjunctival cell in trachoma, a nerve cell in rabies, an epidermal cell in variola—and as the result of cellular reaction a mantle of secretion is thrown around the invading particle. Hence the name *Chlamydozoa*.

In examining blood smears from a case of black-water fever Sir William found large numbers of an unusual type of cell. They were large, averaging about 25 microns in diameter, with a single nucleus which was usually excentrically placed. The nuclear contour was quite sharp. These cells he considered to strongly resemble the endothelial cells found in spleen smears.

In a differential count he obtained 33 per cent of these cells with 8 per cent of transitionals and 41 per cent of polymorphonuclears. There were only 6 per cent of lymphocytes.

Only about 5 per cent of these peculiar cells contained "cell-inclusions."

The inclusions were in the cytoplasm and were from 1 to 5 microns in diameter, were pink or red in color, were, as a rule, ring-form, with a more deeply staining periphery.

From the plate accompanying the article the appearance of the bodies is not unlike that of Negri bodies. They were brought out by deeply staining the films for half an hour with the author's stain and then washing with 60 per cent alcohol.

As to other features of these smears, it is noted that there were no malarial parasites found, but three or four pigmented leucocytes were encountered.—(E. R. S.)

ROGERS, LEONARD. The estimation of the specific gravity of the blood and its value in the treatment of cholera. Indian Medical Gazette, April, 1912.

The author notes that Hammerschlag's method of using a benzene and chloroform mixture to estimate specific gravity of blood is

troublesome. He prefers the method of Lloyd-Jones. In this, mixtures of glycerin and water are prepared of varying specific gravity from 1.048 to 1.070, increasing by 2° in each bottle. A small drop of blood is deposited from a capillary pipette at the center of the surface of the liquid in the series of bottles. The bottles are of half an ounce capacity.

While he formerly recommended transfusion in cholera cases where the blood pressure was 70 millimeters for natives of India or 80 millimeters for Europeans, he now prefers to be guided by the specific gravity of the blood. If the specific gravity of the blood is 1.063, about 3 pints of hypertonic saline solution is indicated; if 1.065, as much as 5 pints may be necessary.

The author also brings out the value of the determination of specific gravity of the blood as a means of diagnosing collapse incident to cholera from that resulting from other causes of collapse—low specific gravity indicating some other cause than cholera.

Attention is also directed to the aid this determination gives us as to estimating the kidney efficiency. Thus, in a case where a European had been successfully treated in the collapse stage with 5 pints of hypertonic saline solution intravenously and 70 grains of permanganate of potash by mouth (in keratin-coated pills) the specific gravity remained at 1.064 in spite of a normal blood pressure. Intravenous injections were administered on three successive days where the indications of renal insufficiency were suggested by a specific gravity approximating 1.064.—(E. R. S.)

PATHOLOGY AND BACTERIOLOGY.

By Passed Asst. Surg. M. E. HIGGINS, United States Navy.

RUEDIGER, G. F., M. D. A study of 35 strains of streptococci isolated from samples of milk. American Journal of Public Health, Vol. II, No. 2, February, 1912.

Streptococcus lacticus (*B. lactis acidii*), which is found in "fresh milk and very often in the healthy milk ducts" and "has no sanitary significance," is differentiated from *Streptococcus pyogenes* by means of the large zone of hemolysis surrounding colonies of the latter on blood agar plates. *S. pyogenes* is occasionally found in milk, "and is indicative of an inflamed condition of the udder of the cow." It is always found in human throats "in tremendous numbers in tonsillitis and scarlet fever."—(SURG. C. N. FISKE, U. S. NAVY.)

MATTILL, H. A., and HAWK, P. B. A method for the quantitative determination of fecal bacteria. Jour. Exp. Med., vol. 14, pp. 433-444.

The method is unique in that it is a chemical procedure, being a simplified modification of the process of MacNeal, Latzer, and Kerr. (Jour. Infect. Dis., 1909, vol. 6, p. 123.)

A 2-gram sample of fresh feces is brought into suspension in two-tenths per cent HCl and centrifugalized three successive times. The bacterial suspension finally obtained is concentrated and extracted with alcohol and total nitrogen determined on the insoluble portion by the Kjeldahl method. Two human subjects were fed on an absolutely uniform diet of simple, easily digestible food for a period of three to four weeks. The average amount of bacterial nitrogen was found to be 53.9 per cent of the total fecal nitrogen. The average daily quantity of dry bacteria calculated from the nitrogen was 8.7 grams.—(PASSED ASST. SURG. E. W. BROWN, U. S. NAVY.)

NOGUCHI, H., M. D. **Pure cultivation of *Spirochaeta refringens*.** Jour. Exp. Med., vol. 15, No. 5, May, 1912.

Noguchi derived his material from a moist condyloma around the anus. The scrapings were ground up with sodium citrate solution and inoculated into tubes of the culture medium used in cultivating the *Treponema pallidum*.

In summarizing, the author states that a strain of *Spirochaeta refringens* has been obtained in pure culture and its morphological and cultural characteristics studied. The strain possessed no pathogenicity for rabbits or monkeys. It probably belongs to the genus *Treponema*, but it is easily differentiated from *Treponema pallidum*, *Treponema microdentium*, and *Treponema macrodentium*. Its relation to *Spirochaeta balanitidis* and *Spirochaeta buccalis* is still undetermined.—(M. E. H.)

CHEMISTRY AND PHARMACY.

Asst. Surg. E. W. BROWN and Pharmacist O. G. RUGE, United States Navy.

EINHORN, M., KUHN, M., and ROSENBLOOM, J. **On the diagnostic value of colloidal nitrogen in the urine in cases of carcinoma.** Arch. f. Verdauungskrankh. Bd. 17, H. 5, pp. 557-561.

This paper is an interesting contribution to the question of the significance of the colloidal nitrogen in the urine in clinical conditions. A number of communications on this topic have appeared recently.

It is claimed that zinc sulphate precipitates the colloidal material, the urine having been previously freed from any albumin present. The technique of the authors is as follows: 100 c. c. of the filtered 24-hour sample is saturated with zinc sulphate; it is allowed to stand for 24 hours, filtered through an ash-free filter, and washed for five successive times with saturated zinc sulphate solution; the filter paper with the precipitate is analyzed for total nitrogen by the Kjeldahl method. The nitrogen of the colloidal material is thus obtained.

The total nitrogen of the urine is now determined. The percentage of colloidal nitrogen present is then readily calculated. Normal individuals show 1.2 to 2.19 per cent of colloidal nitrogen. In various clinical conditions exclusive of carcinoma 1.1 to 2.1 per cent are reported; in carcinoma cases 2.3 to 8.5 per cent are found. The authors therefore conclude that the method possesses diagnostic value.—(E. W. B.)

ADRAIN, C. **The determination of the quantity of residual urine.** *Zeit. f. Urolog.*, 1912, Bd. 6, H. 1.

The percentage of chlorine is determined in a small sample of the residual urine, titration with one-tenth silver nitrate and potassium chromate as the indicator being employed. The bladder contents are now diluted with a measured amount of distilled water; a chlorine determination is now made on this diluted urine; the data for chlorine before and after dilution and the quantity of water used form the basis of a calculation for the estimation of the volume of the residual urine to be ascertained.—(E. W. B.)

ANDERSEN, A. C. **The clarification of the urine in the estimation of sugar.** *Biochem. Zeitschr.*, Bd. 37, p. 262, 1911.

Baag and Bohmanssohn reported that on treating urine with 5 per cent hydrochloric acid the absorption of sugar by blood charcoal was prevented. The author is not in agreement with this conclusion. He recommends the following procedure: 40 c. c. of urine are treated with 10 c. c. of acetic acid and 4 grams of pulverized blood charcoal are added. The mixture is thoroughly shaken for 5 to 10 minutes. The mixture is filtered through a dry filter and a water-clear, colorless filtrate is obtained preliminary to titration by any standard method.—(E. W. B.)

MCGUIGAN, HUGH, **On the excretion of formaldehyde, ammonia, and hexamethylenamine.** *Jour. Biol. Chem.*, Vol. XI, No. 2, 1912, *Proc. Soc. Biol. Chem.*, pp. xxxiii-xxxiv.

When formaldehyde is injected intravenously, it is oxidized with surprising rapidity. One hundred cubic centimeters of 1 per cent formaldehyde, injected into a 10-pound dog in the course of one and one-half hours, completely disappeared from the blood within 30 minutes after the injection. Only formic acid was present in the urine. Formaldehyde is also excreted into but less rapidly oxidized in the intestines. In other instances free formaldehyde was found in the urine only when large doses were given.

A like amount of hexamethylenamine, injected in the same manner, could be found in the blood several hours after the injection. It was

also found (formaldehyde test) in the urine, bile, intestines, eye, saliva, bronchial secretions, amniotic fluid, eggs (hen), and sweat (human). Free formaldehyde is at least much harder to detect in these fluids. The tests in most cases were negative.

Ammonia is not excreted by the lungs. Combined with formaldehyde, however, it is found in the bronchial secretions. From the similarity of the alkaloids to ammonia it was thought that perhaps morphine, which is not excreted normally by the kidneys, might pass through if administered with formaldehyde. No positive result on this point has been obtained.—(E. W. B.)

PETROWA, M. Organic compounds of the aromatic series as cholagogues. *Zeit. f. physiol. Chem.* Bd. 74, pp. 429-435.

The author established gall-bladder and gastric fistulæ and ligatured the ductus choledochus in dogs in order that the effect of different substances on the biliary secretion could be observed. Sodium benzoate, sodium salicylate, thymol, phenol, guaiacol, and menthol all caused a marked increase in the bile flow. The author assumes that the majority of those bodies of the aromatic series, which undergo a splitting in the organism and combine with sulphuric acid to be eliminated as ethereal sulphates, give rise to an increase in the output of bile. Sodium citrate cream of tartar and lactose decreased the bile production.—(E. W. B.)

EYE, EAR, NOSE, AND THROAT.

Passed Asst. Surg. G. B. TRIBLE, United States Navy.

MAYOU, M. STEPHEN, F. R. S., London. An operation for glaucoma. From *Ophthalmoscope*. May 1.

The common fault of most of the operations recently introduced for the production of a filtration cicatrix in glaucoma is that in the course of time the wound heals firmly, filtration through the cicatrix ceases, and the tension of the eye rises again.

Handley has shown, in cases of lymphatic and venous obstruction, that the fluids can be drained away by the insertion of silk threads carried subcutaneously and left *in situ* from the region of lymphatic obstruction to a position whence there is a good lymph flow.

This principle is utilized in the following manner to drain the anterior chamber in glaucoma into the subconjunctival tissue and to produce a definite cystoid cicatrix.

Incision.—After the installation of adrenalin, cocaine, and eserine a very large and thick conjunctival flap is turned forward over the cornea and dissected up to the limbus, dissecting as closely as possible to the sclerotic. With a short Graefe knife an incision about 3

mm. long is made from the outside of the anterior chamber by gradually cutting through the fibers of the sclerotic with the knife point. The incision should start about 2 mm. behind the limbus and be sloped forward, opening the anterior chamber at the periphery.

Insertion of the silk drain.—A piece of black silk thread (twisted silk of size 00) 5 mm. long, having a knot at one end is carefully sterilized, and with a pair of forceps is laid across the incision in the sclera. With a narrow iris spatula the silk is tucked into the incision. As the silk is pushed forward into the anterior chamber, the knot sticks into the lips of the wound, whilst the free end passes forward into the angle of the anterior chamber. The conjunctival flap is then replaced in position, a stitch being inserted if necessary.

The wound in the conjunctiva after 48 hours is usually firmly healed, and the subconjunctival tissue is filled with fluid. At first this usually extends beyond the area of the conjunctival flap, but after a time it becomes more localized. The tension of the eye is usually subnormal from four days to a week, after which time it regains its normal tension.

The obvious danger in the operation is sepsis. The utmost care must be taken to avoid it. The conjunctival sac should be bacteriologically examined and cleansed four or five times a day with boric lotion for three days before operation. After turning back the conjunctival flap, the same instruments should not be allowed to touch the thread, and the latter should not touch the conjunctiva.

The author reports a number of cases. The first case was operated upon 15 months ago and remains well up to the present time.—(G. B. T.)

SMITH, TEMPLE, M. B., F. R. S., Edinburgh; OXON, D. O., Queensland. *Notes from an Indian eye clinic—the Government Ophthalmic Hospital, Madras. Some impressions.* Ophthalmoscope. April 1.

The hospital is built on the pavilion plan, with 144 beds, and has glass tiled walls to the height of 8 feet, and with floors paved with white marble flagstones. There are separate wards for Europeans.

Cataract cases rarely apply for treatment until the second eye is too blind for the patient to go about alone. Morgagnan cataracts form about 17 per cent of the whole.

Lachrymal sac troubles are very common—a large number being complicated by fistula. Trachoma, while prevalent, is not so frequently met with as in Egypt. Squint is rarely met with, only four cases being seen by Dr. Smith in four months' time.

Congenital defects, such as microphthalmic eyes, small corneas, patulent hyaloid arteries, colobomas of the iris, and choroid, are frequently seen. Of quite frequent occurrence is night blindness in

children, associated with xerosis of the conjunctiva. These last cases make rapid recovery when fed on cod-liver oil and liver.

Retinitis pigmentosa was common, and consanguinity of marriage, which is usual among people of a similar caste, is possibly a weighty factor in its production. Optic atrophy, primary and post neuritic, was extremely frequent. There was a history in adults of headache, vomiting, and fever, sometimes associated with convulsions, followed by gradual loss of sight. It has been suggested that such cases as are not specific in origin may be septic from pyorrhœa or sinus disease.

Over 12,500 new cases are seen annually and 1,500 operations performed.

Septic operations are performed in the outpatients' room, while other operations are performed in the general operating room.

An unusual part of the routine for preparation for cataract operations is the irrigation of the conjunctiva with 1-3,000 perchloride of mercury solution. Col. Herbert, who introduced the method, believes that microbes under the conjunctiva are extruded by the free secretion of mucus. Another innovation is the Madras method of opening the capsule before making the incision. This is done with a Bowman cataract needle, with a slender shank and a sharp blade. This is entered at the limbus, when the usual knife incision is made. The operation, if successful, cuts out a small piece of the lens capsule. The gain claimed is that one is able to determine whether the lens is hard, soft, or morgagnan, and modify the incision accordingly. They avoid the conjunctiva flap and always do an iridectomy, and irrigate the anterior chamber with 0.7 saline solution. Glaucoma cases, both taken with a Schiotz tonometer, and eserine instilled.

Other details are extremely interesting, but vary only slightly from the usual routine.—(G. B. T.)

PITZMAN, DR. MARSH. In the report from the St. Louis Ophthalmological Society in a discussion on the antiseptic and germicidal properties of the silver salts. *Ophthalmic Record*, March, 1912.

The position taken was as follows:

That the silver nitrate combines with albumins in a definite ratio of quantities, i. e., enters into a true chemical reaction. Therefore, there are two possible silver-nitrate-albumin mixtures—first, those in which silver nitrate is present in less amount than is required to satisfy the albumin affinities; second, those in which silver nitrate is present in excess of the amount to satisfy the albumin affinities. The first class (without free AgNO_3) are poor germicides, killing staphylococci only at the end of 12 hours, but are antiseptics. The second class are powerful germicides. Argyrol belongs to the first class. Albargin, tathargan, novargin, protargol, and most of the

newer preparations belong to the second class, and are good germicides. As the second group contains an excess of free silver nitrate it does not appear reasonable that its members can have any real advantage over the simple dilution of the nitrate of silver.—(G. B. T.)

WILKINSON, GEORGE, F. R. S. **Notes of three cases illustrating infection of the accessory sinuses by entry of water into the nose during bathing.** Proceedings of the Royal Society of Medicine. Vol. 5, No. 3, January, 1912.

NOTE—The author reports three cases of unusual interest from the standpoint of the service—the etiology being, as noted in the title, entrance of water into the accessory sinuses from the nose. Similar cases will undoubtedly be encountered with us, especially from diving, etc., in tropical waters, swarming with parasitic life.

Case 1.—Frontal sinus suppuration. Man, aged 19, who was operated on successfully for right frontal sinus suppuration in November, 1905, attributed his nasal trouble to a "cold after bathing." On further inquiry the following account was elicited: When at school he was in the habit of bathing with other boys in a canal. On one occasion, two years previously, he got a nose full of water after diving in. Next day he had rather a severe headache and a severe chill in the head. Profuse purulent discharge followed. Since that time he has suffered with a stuffiness of the right nostril, offensive discharge, frontal headache, dizziness on stooping, and sleepiness.

Case 2.—Left antral suppuration. A married lady, aged about 32, first seen on May 2, 1910. She was found to have a fetid empyema of the left antrum. This was cured by a Caldwell-Lyc operation. She likewise referred the starting point of the nasal trouble to a "cold caught at the swimming baths, six months previously." Being asked for details she said that on the last occasion when she visited the baths she had a fainting attack and sank to the bottom. She was quickly hauled out. The next day she had violent neuralgia in the face and frontal headache, and was confined to bed for several days. On subsidence of pain she was left with a severe "cold in the head," with purulent offensive discharge from the nose, which mostly found its way to the back of the throat. The discharge had continued ever since, and she has suffered from severe frontal headache.

Case 3.—Ethmoiditis with polypi, secondary infection after bathing, acute septic ethmoiditis and frontal sinusitis; osteomyelitis of the frontal bones, subdural abscesses, and abscess in the left frontal lobe—death.

A youth, aged 17, was seen at the Sheffield Royal Hospital on August 16, 1910. Pus, polypi, and swelling of the middle turbinal were found in the right nostril. He was entered for admission to the hospital for curetting of the ethmoid. As it was not regarded as urgent, admission was deferred for a fortnight, to allow of his taking of a holiday at the seaside. When sent for at the end of the time, he did not appear. He was sent on October 2 by his medical attendant as suffering from "orbital abscess." He gave the history, that on the day of his return home from his holiday he began to be ill, with intense headache and "cold in the head." On the day previous he had bathed in the sea. He rapidly became worse, with severe pain and tenderness over the forehead, and fever. The right eye and the forehead swelled. A diagnosis of acute septic frontal sinusitis and osteomyelitis of the frontal bone was made. Both frontal sinuses were opened and were found to contain a quantity of pus. At a subsequent operation large subdural abscesses on both sides were opened. Eventually he died, on November 9, with left-sided frontal lobe abscess.

In the discussion it was brought out that similar cases had been under observation by others, and that samples of sea water from the health resorts of the English seacoast contained in every case *Bacillus coli communis*.

However, there is much less likelihood of nasal and accessory sinus infection than there is of acute suppurative middle-ear troubles.—

(G. B. T.)

MILLIGAN, W., M. D. **Three cases of chronic suppurative otitis media.** Proceedings of the Royal Society of Medicine. November, 1911.

The author reports three cases of suppurative otitis media of long standing, complicated by involvement of the bony wall of the labyrinth.

Notes of the third case are of interest.

J. F.—Admitted in September, 1911, giving history of left-sided suppurative middle-ear disease of 15 years' duration. For three weeks prior to admission there began frequent attacks of vertigo accompanied by vomiting, irrespective of ingestion of food. Temperature 99°, pulse 80, respiration 16. Left meatus entirely blocked by granulation tissue, fetid discharge, slight mastoid tenderness, but no edema. Cochlea Watch not heard. Loud conversation just heard. Low-toned tuning fork just heard in left ear, but referred to right side; high-toned tuning forks referred to and just heard in right ear. Vestibulo-canalicular system: Spontaneous nystagmus present, quick movement directed away from the lesion, no "fistel-nystagmus." Caloric reactions: no definite reaction with hot or cold water. (Action probably nullified by the presence of granulation tissue in external and middle ear cavities.) Gait: Patient steady on his feet when walking, or when standing with his feet together and eyes closed. On attempting to stand with eyes closed and upon one leg, falls to affected side. Knee jerks increased; no ankle clonus; no Babinski or Kernig's sign.

Operation: Complete postaural operation performed; large fistula in external labyrinth canal, surrounded by apparently necrosed bone. No pus was seen to exude. Discolored bone removed, but membranous canal not opened.

In the discussion of these and similar cases the consensus of opinion appeared to be: That a radical mastoid operation was sufficient, at least for the first operation, unless there was an absence of vestibular reaction, in which case the labyrinth should be broken into and cleared out.

If there were persistent granulations or persistent vertigo, or the symptoms relied upon by Alexander—continuance of vertigo, the presence of pain, discharge, and headache—particularly occipital headache, it was not wise to wait, lest the disease should extend.—

(G. B. T.)

REPORTS AND LETTERS.

AN ACCOUNT OF THE SINKING OF THE JAPANESE BATTLESHIP "HATSUSE" IN THE LATE RUSSO-JAPANESE WAR.¹

[Report on the loss of the *Hatsuse*, by the senior surgeon ad interim of the *Hatsuse*, Asst. Surg. (2d class) Nunogami Gyoichi. Translated from the Japanese (official report) by M. le Dr. Chemin, Médecin de 1re classe. Archives de Médecine et Pharmacie Navales, September, 1911.—Translated from the French.]

By Surgeon F. L. PLEADWELL, United States Navy.

On May 14, 1904, at 6 o'clock in the evening, the *Hatsuse*, carrying the flag of Rear Admiral Nashiba Tokioki, commander in chief, set out in company with the *Shikishima*, the *Yashima*, the *Kasagi*, and the *Tatsuta* from the island of Richozan Retto to establish the blockade off Port Arthur. The *Takasago*, charged with another mission, also accompanied us.

The following morning, the 15th, at 1.30 a. m., the *Tatsuta* changed course in the direction of Minami Sanzanto. The *Kasagi* proceeded at increased speed to Port Arthur. On this day the weather was clear and the sea smooth; a moderate breeze blew from the southward. At 7 a. m. we cleared for action. The ships slowed to half speed. At 10.50 a. m., when the *Hatsuse* was 35° N. of the peak of Rotetzugan, at a place where Nishi Ouganzan could be seen to the NNW., suddenly something was felt to strike the ship aft. Not being on duty I was on the shelter deck aft looking in the direction of Port Arthur, then at some distance. Scarcely had this shock been felt when the afterpart of the ship was almost completely obscured by a thick cloud of black smoke. The ship listed slightly to starboard,

¹ The many and notable incidents of the Russo-Japanese War which arose as a consequence of the extensive use of mines and mining by the belligerents have served to indicate unquestionably that in any future conflict involving naval operations these weapons will exert an important influence even in battle tactics. It was recently stated by a naval essayist in a paper dealing with mines, "It (i. e., the mine in this war) emerged from the position of an uncertain weapon for harbor defense and assumed the rôle of a powerful weapon of war capable of use either for offense or defense."

What a potent factor in naval war the mine may be, both in its depressing effect on morale and in the extreme physical damage it is capable of inflicting, may be gathered from the following very graphic account of the loss of the Japanese battleship *Hatsuse*. This account was written by a Japanese naval surgeon who was on the *Hatsuse* at the time of her destruction. It has recently appeared as a translation by a French naval surgeon, in the "Archives de Médecine et Pharmacie Navales," from the Japanese official report. Few narratives of disasters of this character have given us a more vivid description of what occurs in a ship when striking and detonating a mine. The thoroughness of detail of this account, as well as the recent appearance in the Naval Medical Bulletin of the very informing and interesting article by Surgeon T. W. Richards, on the loss of life by drowning, in naval warfare, suggested the desirability of making this account of one of the major causes of loss of life in this warfare more generally accessible to the service. I have endeavored to reproduce Surgeon Gyoichi's account as faithfully as possible from the French text, departing from it only when no equivalent term or expression in our service would convey the desired meaning.—(F. L. P.)

and I learned that we had struck and exploded a mine. I ran immediately to the stations for the wounded. Attendants were gathering together important records. They were ordered to assemble the sick. As the hatches were already closed to prevent the inrush of water to the lower decks, communication with the stations for the wounded during action was soon to be completely shut off. Therefore the medical personnel assembled aft on the starboard side of the turret, in a place where they would not be in the way of maneuvers on the part of the deck force. All the important documents were collected in one place. (All the books were placed in a boat, so as to save them eventually.)

The senior surgeon, Seki Bun no Suke, who was seated at work below in his room aft on the starboard side, was, with his chair, projected into the air quite a distance by the violence of the concussion. At the same time his electric light was extinguished and his instruments thrown to the deck and broken. Smelling the disagreeable odor of powder gases he realized that there had been a mine explosion. He hastily tried to reach the upper deck but already the ladder from the officers' quarters had fallen. Fortunately, he was able to get out by means of a line that was hanging down and he went to take up his duties.

Asst. Surg. Second Class Uemiya Shigekichi was in a stateroom of a neighboring officer and as rapidly as possible went to the station for wounded and directed the preparation of material for first aid to any men who might have been hurt. On this day there were four exempt from duty (i. e., on the sick list, F. L. P.); three of these assembled immediately; the fourth was not found at once and he was only located after a long search. On the lower deck men were rendered unconscious from the violence of the shock. They were quickly attended to and soon recovered. The sick, mentioned above, were cared for and then the material for care of the wounded was placed in readiness for use.

Later I learned that when the mine exploded, striking the port side of the after compartment of the steering engine room, there was a machinist on watch there, and three others were in the forward compartment of this room. The one in the after compartment could not escape; those who were in the forward compartment, not having time to close the water-tight doors separating the two compartments, the water having suddenly entered, they scarcely had time to escape. They immediately closed the hatches leading from the steering engine room. The torpedo magazine is just forward of the steering engine room and it appears that when these hatches were closed the water had risen to within 30 to 60 cm. of the armored deck. In spite of all efforts water entered more and more, the ship listed little by little to port, and the stern began to sink.

About 12.20 p. m. the level of the incoming water already reached almost to the level of the after gallery. All the crew, already on the upper deck, were preparing the steam launches; a signal was made to the *Kasagi* for assistance, and the second cutter took to her a wire hawser from port and one from starboard. At the same time, to prepare for any eventuality, the first and third cutters were prepared and fires lighted in the steamers. Several rafts were constructed on the starboard boat deck and on the after deck. Everything that could float was detached. The barge and launch were hoisted out and their masts stepped.

At 12.34 p. m. as far as one could make out the ship was headed toward ENE. When the peak of Rotetsuzan was bearing E. 40° N., there was felt a strong shock from two explosions close together, apparently beneath the after turret. There was a formidable noise and at the same time flames and smoke burst forth. The boat and lading crane on the aftermast as well as the smokestacks fell; the deck flew up into fragments, and on all sides fell a shower of pieces of wood and steel. The ship listed rapidly, then sank by the stern, disappearing in about a minute and a half.

The *Kasagi* being close by, her crew was able to follow closely all the details of the catastrophe. We afterwards questioned them, as well as the *Hatsuse's* men as to what had happened. They replied that the forward end of the ship was suddenly raised and then the side of the ship which had struck the mine was elevated vertically about three meters. Most of the crew slid over the deck to the starboard side and fell into the water. Others were enveloped by the flames from the explosion. Still others were thrown from the after bridge to the deck aft. With the noise of the explosion were mingled the cries of drowning men. The ship was thrown back over to port and when she sank an enormous suction wave was produced. Hammocks, rafts, pieces of wood, etc., floated to the surface of the water and bobbed about pell-mell among the drowning men. Some of those in the water had their heads carried away; others their limbs torn off; others were locked in embrace and several clung to their neighbors' feet.

It was a heartrending spectacle exceeding all powers of description. I felt the commotion caused by the violence of the explosion and fell to the deck unconscious. The men on the afterdeck and the bridge and other falling objects fell on me. Suddenly recovering my senses, I found myself enveloped in black smoke. Everything was obscured about me; I could distinguish nothing even at a little distance. But the wind began to dissipate this smoke and I saw falling about me fragments as thick as hail and blood flowing in streams from the dead and wounded.

The after deck was at this time scarcely 30 centimeters from the surface of the water. I then jumped, dressed and with side arms, into

the water.¹ I was dragged down by an eddy, but having soon come to the surface I began to swim, and turning my head about I saw the ship standing up vertically, already half engulfed. A thick black smoke arose, then the *Hatsuse* gave out strong flames and disappeared beneath the surface of the water. While I swam I was drawn back by an enormous suction wave or vortex. I became the plaything of the waves; I swallowed a large quantity of sea water and commenced to feel suffocated. Later, worn out, I could swim no longer, when happily I saw a hammock floating on the surface of the water and immediately seized it. I looked about over the surface of the sea; already the *Hatsuse* had disappeared and where she had formerly been now only waves and abundant foam could be seen. All about floated many hammocks, rafts, tables, and all sorts of wooden objects, in the midst of which one could see the heads of swimming men like rows of black peas that some one might have thrown there. It was heart-rending to think that although many were doomed to inevitable death not one man cried for help. When the rescuing boats arrived the men first indicated where officers might be found, not wishing to be saved in advance of them. It is in the presence of such acts of heroism that one can not but feel profound admiration for them. While I was hanging on to my hammock, several men near me insistently hailed the rescuing boat, indicating to them by loud cries that an officer was near by. I was soon rescued by the boat and carried to the *Kasagi*. The temperature of the water must have been at this time about 50° F.; but as I had remained more than 20 minutes in the water, tossed about incessantly by the sea, when I was finally rescued my body was completely chilled and I lost consciousness. The men who manned the boat took off my clothing and warmly covered me with a belt and dry clothing. Under these trying circumstances the discipline and zeal of the men were truly admirable. I remember also that while I was in the boat which had rescued me I had several attacks of nausea, and vomited.

The *Tatsuta* and the *Kasagi* were the ships concerned with our rescue this day. It was, thanks to the courage of the personnel of these two ships, that a relatively large number of our men were saved. All the survivors will never fail to remember their devotion.

The commander in chief, Nashiba, had gone to the *Tatsuta*, on which he had raised his flag. At this time, the rescue of the men being completed, preparations were made to get underway again. Suddenly 16 of the enemy's torpedo-boat destroyers, following each other very closely, came out of Port Arthur and chased the *Tatsuta*; but the *Kasagi*, the *Takasago*, then the *Suma*, the *Chiyoda*, and the *Akitsu* of the sixth division, came to her assistance and repulsed

¹ For medical officers, and for officers of other corps, with certain uniforms, a short sword or dagger is worn.

the enemy's boats. The *Tatsuta* then proceeded rapidly toward the island of Richozan Retto and the *Kasagi* soon followed.

In this disaster Commander in Chief Nashiba and 340 men were saved from certain death, 216 being received by the *Tatsuta* and 124 by the *Kasagi*. Of this number 61 saved by the *Tatsuta* and 30 by the *Kasagi* had been wounded. In such an overwhelming catastrophe a larger number were saved than one might expect. The reason was that from the moment of the first explosion a considerable number of men were at work on the upper decks, and since a number of hammocks, rafts, and pieces of wood were left floating many men were enabled to save themselves by seizing these articles. If these articles had not been prepared, immediately following the first explosion, the crew would doubtless have had the same fate as those on the *Petropavlovsk*.

This experience shows how indispensable it is in preparing for action to dispose hammocks about the upper decks. Not only do they serve to minimize injury from flying fragments of shell and splinters, but they can also be utilized as life buoys. I must note here that the four men who were on the sick list, of whom I have previously spoken, and one man who was injured and who had been allowed to lie down in the station after treatment, were happily saved.

THE SITUATIONS AND CONDITIONS UNDER WHICH MEN WERE PLACED AT THE MOMENT OF THE MINE EXPLOSION AND CONSIDERATION OF THE DAMAGE PRODUCED ABOARD.

At the time of the first explosion, a large number of men were under the middle (*moyen*) deck. There was for a moment, a little confusion; nevertheless, not a man created disorder, or uttered a cry of fright, no one was overcome by panic, and none threw themselves into the water. Quiet was soon restored and each took up his work with the greatest composure and worked zealously. When the second explosion occurred, the commanding officer, realizing that anyhow it would be impossible to save the ship, gave the order to hoist out all boats; but in an instant all was held up; the water already reached cutters Nos. 1 and 3, before there was time to clear them and it might be said that the ship sank with her boats still at the davit heads.

At this moment most of the men were on the deck forward occupied with preparing the steam launches; others on each side of the boat deck were working the guys of the boat lifts. A dozen seamen with the master carpenter and several men of the carpenter gang were working on the after part of the middle (*moyen*) deck and the main deck aft, attempting to protect the ship from further invasion of water. In addition a number of men were occupied in leading out a wire

hawser from near the after turret port side to the port side of the upper deck forward. A little more than half the fireroom force were on duty. The remaining ones together with the cooks and galley force were passing boxes of biscuit and hard bread from the ammunition passage forward to the upper deck, and going to and fro to distribute it to the other decks.

The medical personnel, comprising Staff Surgeon Seki, Asst. Surgeon (2d class) Uemiya, Second Hosp. Steward Kono, Hosp. Apprentice (1st class) Nakamura, Hosp. Apprentices (2d class) Nuzato and Imamura and I, in all seven persons were on the starboard side of the after turret, as I previously mentioned. The other sick bay attendants Yoshida and Yasuda were not with us, being detained elsewhere on duty.

The personnel of the commissariat were on the forward shelter deck guarding documents. The secretary of the admiral's aid also had charge of the papers and was standing in front of the commanding officer's spare stateroom.

It was in the vicinity of the main mast that the explosion was most violent. All those who were on the upper deck in this place were killed. Those who were forward and on the after deck were overcome by flames and either burned or wounded or killed by flying fragments. Still others who were overcome by the concussion of the explosion were drowned, being dragged down by the ship when she sank.

While it is well nigh impossible to tell exactly what damage was done on board, the second mine having exploded beneath the after powder magazine, it is probable that the shock determined also the explosion of the contents of the magazine itself. Flames having issued freely from the smokestacks it is likely that the explosion also completely destroyed the firerooms. Furthermore, except for those firemen who were on deck passing biscuit boxes, none were saved. The men who were on the middle and lower decks attempted to reach the upper deck, but the ladders having already fallen and the hatches having been closed, only a few could save themselves. Some said that the ship seemed to have parted amidships. I am going to relate here what some of the men said when they were mustered after rescue and asked about their experiences.

When the second explosion occurred, three boats were lowered, the second cutter, the barge, and the launch. The second cutter was engaged in carrying a towing hawser to the *Kasagi*. This ship being at quite a distance from the *Hatsuse*, the men manning this boat escaped the disaster. The launch was secured astern, her bow resting against the side of the *Hatsuse*. The crew threw themselves into the water, and all were drowned in the suction or vortex, except two men who had hesitated to jump overboard, and remained aboard the boat.

a circumstance which saved them. The barge was moored alongside forward on the starboard side; four men were in her; seeing that they could not cut the painter two of them jumped overboard; all four were fortunately saved. Under the boat deck to port, the heads of several men could be seen and several men had fallen to the starboard side of the boat deck while eating biscuit there.

THE CONDITIONS SURROUNDING THE MEDICAL PERSONNEL AT THE
MOMENT OF EXPLOSION AND SHIPWRECK.

The Senior Surgeon Seki Bun no Suke: This superior officer was standing facing aft to the right of the after turret, looking in the direction of the *Yashima* through a telescope; at the second explosion he was seen to fall on his back, and he had lost an arm and a leg. I have not been able to state the cause of this mortal wound. While I have no exact information on the subject, I think that the cause of death must have been an overwhelming hemorrhage from an important vessel, or an injury from the crushing impact of a flying fragment. Asst. Surgeon (2d class) Uemiya Jhigekichi: Before the explosion this officer was standing facing to the starboard. He was thrown to the deck behind me by the force of the shock. No one knows whether or not he was wounded; but recalling the danger to which every one was exposed in this spot, I think he must have been struck by a fragment or burned. It appears probable that his death was caused by a blow from a fragment which injured an essential organ or by a wound causing disruption. Hosp. Steward Yoshida Yoshiyuki: This petty officer was standing looking forward, in front of the head on the port side of the upper deck. This place was relatively safe and the shock should not have been violent. I have not heard of any men having been injured in this place. It is difficult to state how this petty officer died. I suppose he must have drowned when the ship sank. Hosp. Steward Kono Tanekichi: This petty officer was seen running in the vicinity of the mainmast at the time of the second explosion. It is reported that he was thrown into the flames, and his death must have resulted from extensive burns. Hosp. Apprentices Nuzato Narikiyo and Imamura Ijiro: According to Hosp. Apprentice Nakamura, these two men were in the same place as he before the explosion, but when he came to himself he did not see them any more. It is likely that they had the same fate as Hosp. Steward Kono. I have since learned that none of these men knew how to swim. Hosp. Steward Yasuda Kotaro: This petty officer knew how to swim. At the time of the second explosion he was in the dispensary looking to see if any important papers remained there. Although at that time he did not feel that a serious explosion had occurred, he had a vague idea that a mine had been struck. He

hastily sought the upper deck by the nearest hatch forward and jumped overboard on the starboard side. At this time the ship was already submerged to the level of the forward gangway. While swimming about he saw a floating hammock, seized it, and then caught hold of a table. He was finally rescued by No. 2 cutter and taken aboard the *Tatsuta*. He was in the water about 20 minutes. Hosp. Apprentice Nakamura Gungi: This man was in our party, standing, facing to starboard. He lost consciousness and suddenly fell, following the shock of the second explosion, but he soon recovered. He climbed up to the boat deck, but as he prepared to climb into a boat by the davit to which this boat was hanging he was dragged back by a vortex of water. Regaining the surface of the water, he caught hold of a seaman's bag floating by and was afterwards saved by a boat and taken to the *Kasagi*. This man also knew how to swim. It should be noted that almost all of those who did not know how to swim perished. It is desirable, therefore, that in future all men be made to exercise in swimming.

STATE OF MIND OF THE CREW IN GENERAL, NATURE OF WOUNDS,
AND SENSATIONS THEY EXPERIENCED.

Since the first battle and following each new engagement, the morale of the men became enhanced more and more; they were elated, courageous, and vowed the destruction of the enemy. The crew was particularly composed and collected at the time of this explosion. Each took up his duty without the least fear, without disorder, and with a calmness and promptitude that was praiseworthy. The second mine having exploded the powder magazine, almost all those in its neighborhood were wounded. Many of the wounded that survived were knocked down by the violence of the shock, but they soon recovered spontaneously or after feeling the inrush of water or other sensations. Some were dragged into the water, others threw themselves into the water. All these men, wounded or not, were in the water from 5 to 25 minutes. During this time, hovering between life and death, they dared not cry for help, awaiting calmly the arrival of a rescuing party. This catastrophe having occurred unexpectedly, the impression produced upon the minds of the men was much more intense than during the engagements with the Russians. This difference is to be attributed to the suddenness of the event.

I am now going to report the more or less marked effects produced upon the mental and physical condition of the men noted some days after they had been saved. The effects are a consequence of the sudden impression on the nervous system.

Men did not feel the sensation of cold nor that of pain from their wounds from the time they were thrown into the water. In fact, the

majority of them were not aware of their wounds until they were taken into the rescuing boats and saw they were bleeding, and there were many who did not feel the slightest pain and did not commence to feel pain in their wounds until after they had been transferred to the *Tatsuta* and *Kasagi*. When I questioned them as to the cause of their injuries, many had forgotten, and very few could give me any precise information about their feelings at the time of the explosion. Some only said that they had a sensation like that of an electric shock and others replied that they had only had the impression that it was all a dream. Nevertheless the fact of explosion was apparent to them. I was embarrassed myself to give an exact appreciation of events. In fact, the men who were exposed to the force of the explosion all suffered from cerebral concussion, and those who fell unconscious of course felt no sensations, and very few had clear impressions of what occurred, but when they recovered their senses, events presented themselves more clearly to their minds. As to myself, I can only recall that at this instant I experienced various sensations until the moment when I saw the external world again.

Many of the wounded I examined several days after their rescue presented symptoms of loss of appetite or lessened appetite, insomnia, mental agitation, and physical uneasiness; many of them were easily frightened by slight noises or slight jar. Those who presented these symptoms most markedly still suffered a week later, after their admission to the naval hospital at Sasebo, from fright upon the slightest disturbance; if they heard the noise of a gun firing, they would sit up in their beds in a state of terror. These three signs that I have just noted have been common to almost all the men; they have rarely been missing. There were variations in the intensity of the symptoms according to the degree of nervous resistance and physical vigor possessed by the individuals affected. Men who had been wounded generally presented these symptoms in more marked degree than those who had not, but as a matter of fact the differences noted were not very great. Some, after being rescued, vomited and felt intense thirst; others suffered from headache lasting several days. This headache must have been caused by cerebral anemia; the thirst was not due to hemorrhage, but must have been the result of exhaustion and swallowing of sea water; vomiting was produced for similar reasons.

These two symptoms, thirst and nausea, might have resulted from irritation of the digestive tube and the cerebral concussion from which many suffered. There were very few survivors who had not swallowed a quantity of salt water. I have not noticed in the subjects presenting these symptoms, headache, thirst, and nausea, any great difference between those who were wounded and those who were not.

As I have just stated, the mental state of all these men is easily comprehended from the time they were thrown into the water until they were rescued; but although a certain number among them bethought themselves when in the boat to row vigorously, after having been saved, there were many whose faculties were obtunded for a while and who fell into the boat quite overcome. However, they recovered their senses without any particular treatment, and it did not appear to me that they presented an abnormal aspect when they came aboard the rescuing ship. I should nevertheless mention more of this state of stupor of which I have already spoken above. Apart from that, I have not remarked any appreciable change in their mental condition. I was not able to examine all the wounded who suffered from concussion. Among those I did examine the greater number were in the afterpart of the ship at the time of the explosion, only a few from amidships, and not a single one from forward. This bears out the idea that the violence of the explosion diminishes as one goes from the spot where it occurs.

The wounded who survived, having received slight wounds only, I do not think it of interest to speak of them further. Unfortunately, I have not been able, as I have previously stated, to examine all the wounds, especially in the wounded who were transferred to hospital ships. I could only examine critically, five days after the wreck, those wounded who had remained on the *Tukuoka Maru*; but all these were only slightly wounded. I can thus only conjecture the exact condition of wounds at the beginning. I lack precise information on the frequency of hemorrhage and the degree of infection of wounds, etc., from the time the men were wounded. I believe, however, that hemorrhage was generally not serious. As for the condition of the wounded cared for on the *Tukuoka Maru*, where they had practiced perfect antisepsis, one could get an idea of infection if the fact of their immersion in salt water for a certain length of time was only coincidence.

Many of the wounded only began to feel pain several hours after being received aboard the rescuing ships. Quite often painful wounds seemed to be otherwise trivial. Particularly in the case of contusions there were men who only complained of pain the following morning. Apart from the graver wounds which ended in death, the following varieties were frequently observed: Contusions, contused wounds, superficial wounds and burns. Although I do not know the exact cause of the wounds, I think they were produced by fragments of wood and iron projected about by the explosion. Contusions might have been caused from falls on deck and against neighboring objects, or against floating debris which they struck in the water or in leaping overboard, or by striking against the plank-

ing of the rescuing boats. Of all these causes I can not say which was the most frequent. The burns were due, of course, to the explosion of powder. As for other injuries, such as fractures, they were very rare. I believe there was only one man with a fractured rib and another with broken fingers.

Compared with wounds caused by shell fragments all survivors presented wounds of slight degree, but those who were instantly killed received very grave and very complicated injuries. Undoubtedly the fatal injuries produced by blows or burns often had a mangleing or disrupting effect. Those receiving wounds of this character must have died on the spot, or if they did not die at once they were helpless and their end came by drowning. More than half of the wounded that were treated had only slight wounds.

An accident of this character must be looked upon as an unparalleled disaster. The destruction of a ship following the explosion of a mine may only be compared with calamities like those resulting from earthquake or volcanic eruption. The pen is powerless to describe such a catastrophe. The mental impression on the minds of the unfortunate victims was terrible. Since the disaster I have not heard of a single man who has presented modifications in the condition of his mental faculties. This seems to me extraordinary. I regret so much the impossibility of recording more accurate observations on the men who were wounded in such an exceptional disaster.

ADDENDUM.

Many men not having had time to remove their clothes were blown into the water fully dressed. Some had taken off their shoes previously in order to work more comfortably, but few had time to do so after the explosion had occurred. It is beyond a question of doubt that well-lashed hammocks can take the place of life buoys. It is difficult to say how long they will resist penetration of the water and float, for no special experiments to determine this have been made, but there was an instance on this occasion where a man sustained himself afloat by means of a hammock for over an hour. I heard that hammocks were still floating the following morning.

It has been stated that the boats in which important papers were placed went down with the *Hatsuse*, but the papers which could float afterwards came to the surface. One volume containing medical observations which had floated about until the following morning was recovered by a torpedo-boat destroyer. The registers made with European paper imbibed water much more freely than those made of Japanese paper.

**ORGANIZATION, CAMP MANAGEMENT, AND SANITATION IN EFFECT
AT THE MARINE BARRACKS, CAMP ELLIOTT, ISTHMIAN CANAL ZONE,
PANAMA. [APR. 15, 1910, TO FEB. 26, 1912.¹]**

By Major S. D. BUTLER, United States Marine Corps.

ORGANIZATION: Four companies, average 3 officers and 110 enlisted men, full quota of noncommissioned officers. Companies divided into squads with noncommissioned officer in charge of, and responsible for, each squad. It is considered of the utmost importance that all noncommissioned officers be well behaved and efficient, and that they be strictly held to their responsibility as such, and that proper respect on the part of private soldiers toward the noncommissioned officers be enforced. The majority of the noncommissioned officers of this organization are good, to which fact I consider any success this organization may have attained is largely due.

MESSES, RATIONING, ETC.: Company messes with full quota of competent cooks and messmen, largely trained since formation of battalion. Messes carefully managed under the direct supervision of company commanders. Between 30 and 40 per cent of Government rations commuted and a variety, as much fresh foodstuffs and fruits as possible, is purchased from the Panama Railroad Commissary and outside market. This I consider most important.

DISCIPLINE, LIBERTY, AMUSEMENT, ETC.: First. In order to have a successful command the men must be carefully recruited for physical, mental, and moral qualifications. The enlisted men of this command are far above the average, although no effort was made to select them after enlistment, 95 per cent having joined us as recruits. Second. Good physical and moral men having been secured, it is necessary to teach them obedience. Third. They must be taught personal self-respect and responsibility. The men of this battalion have learned all these lessons, and have never gone on liberty under guard, and no posts are maintained to keep them in camp. The only restrictions on liberty being those required by health and in the cases of those men who have demonstrated that they have not yet learned to behave themselves on liberty. At present but two men are restricted for the latter cause. I do not believe in discharging men except for physical disabilities which careful treatment and training can not correct, and for offenses so serious that a retention of the man in the service would be a decided menace. It has been a rule in this battalion to discharge, by sentence of summary court-martial, only such men as have been found guilty of theft or lying, or those who, after every other corrective method has been employed, have proved themselves a decidedly bad influence. I should say that 90 per cent of the original constant offenders have turned out to be useful men. This battalion has performed an enormous amount of construction,

¹ Received March, 1912.

repair, and police work, and has been kept constantly occupied with drills and instructions or manual labor, to which I attribute the greatest part of any success we have had. I have endeavored to maintain the strictest discipline among officers and enlisted men, requiring the former to set, by their conduct, a proper example for their men. No enlisted man has been used as a personal servant or striker or has been permitted to perform any duties for an officer or about an officer's quarters which in civil life would be performed by a servant. This I consider has added greatly to the self-respect of the enlisted personnel. No men are permitted on liberty after sundown without special permission, and extended liberty beyond 10 p. m. is not granted without express authority from the commanding officer, and is generally given as a result of a competitive inspection held weekly. There is no secret about the condition of this command; the officers and men are splendid and obey to the letter every order, as they realize none are issued for the sake of making a noise. It has been the endeavor in this post to provide amusements warranted to attract the command during all their spare moments. The command erected with its own labor, and largely with its own funds, a fine big gymnasium with bowling alleys, pool tables, shooting gallery, stage for theatrical performances, and a moving picture machine, with which equipment some form of entertainment is provided each evening. A band of 28 pieces was organized among the enlisted men, who from their own personal resources purchased their instruments, some paying as much as \$165 for a horn. These men do soldier's duty in addition to playing in the band, and by their own efforts have increased the happiness and contentment of this post 100 per cent. In the amusement of the men Mr. J. Dwight Safford, a representative of the Young Men's Christian Association, who lives in this post, has rendered invaluable services, and any post will be fortunate to secure such a representative of this organization.

SANITATION, ETC.: The grounds, stables, and washhouses are inspected daily by the officer of the day; men's barracks, mess halls, and kitchens daily by a company officer; parts and very often the whole of the camp daily by the post surgeon; while the commanding officer, with his staff, inspects grounds, buildings, and the men with their accoutrements and clothing twice weekly. At least once a week the entire camp is policed thoroughly inside and out. Prophylactic treatment as a preventive of venereal diseases has been made compulsory, and a man failing to take this treatment and later developing a venereal disease is court-martialed for disobedience of orders, with the result that cases of this complaint have been few. I consider it absolutely necessary that a competent, sensible, and energetic medical officer of irreproachable personal habits be attached to any command for its health and comfort. The medical officer of

this command fulfills all these conditions and more. I have never had a misunderstanding with the post surgeon and have never received from him a recommendation which I did not heartily concur in and cause to be carried out to the letter.

As the following are some of the general and special sanitary measures coming more particularly within the province of the medical officer, this part of the report has been prepared by the post surgeon (Asst. Surg. John G. Ziegler, U. S. Navy).

1. A thorough physical examination of the entire enlisted command as soon as practicable after their arrival at the post. This served to show up the physical deformities of each individual, such as flat feet, hammer toe, varicocoele, phimosis, enlarged tonsils, etc. When such conditions were discovered, operation for their correction was described and advised. No attempt at compulsion was made, but each man was given to understand that in case of disability that was traceable to such conditions it would be regarded as not in the line of duty. In most cases the men appreciated that such advice was for their benefit and readily acquiesced to the treatment suggested. Similar examinations were made from time to time, since they served to maintain a greater interest in personal hygiene and to reveal any attempt at the concealment of venereal and parasitic diseases.

2. Ridding the command of the physically unfit, and the mentally deficient, and the morally undesirable. The two former classes were disposed of by medical survey after a sufficient period of observation to eliminate suspicions of malingering or to demonstrate the inability of their correction. The latter class were given an opportunity to reform, but if they persisted in wrongdoing, were sentenced to bad-conduct discharge by summary court-martial.

3. Prophylactic measures directed against special diseases:

(a) *MALARIA: Medicinal.*—For three months after their arrival at camp, the taking of 10 grains of quinine daily was made compulsory for each man. After that period the routine daily administration of quinine was made voluntary except in cases of men who had become malarially infected and as such were a menace to their companies. These men continued taking quinine daily during their stay on the Isthmus. Liquid quinine is given preference, then capsules, and then pills or tablets, in order of effectiveness.

Physical and mechanical.—Thorough screening of all barracks and sleeping quarters with the additional use of mosquito nets at night. Such screening and nets receive frequent inspections by the commanding officer, officer of the day, and medical officer and repairs are promptly made when needed. The doors of the barracks are kept closed after sundown and mosquito nets are let down and inspected before bedtime, thus revealing any mosquitoes that may be in hiding in the folds of the net.

The destruction and prevention of mosquitoes and their larvæ.—The camp is kept so clean and well policed that virtually no mosquito-breeding places exist. Nevertheless should such places be discovered they are promptly destroyed by filling in or draining as may be necessary. As a precautionary measure all drains and marshy places are kept well oiled. This is done once weekly by the hospital corps men in charge of a hospital steward especially trained for the purpose. At certain places stationary automatic oilers are placed. These are improvised from empty tin cans having a perforature in the bottom, so adjusted as to allow the oil to drop automatically at the rate of about 30 drops per minute. The cans are filled with larvacide, a cresol combination, which is very diffusible and which spreads rapidly on the surface of water. The officer of the day reports after his daily inspection the presence or absence about camp of any receptacles capable of retaining standing water and such recep-

tacles found are destroyed or corrected. Finally, a hospital corps man is detailed to capture any individual mosquitoes that may have entered the shacks. This is easier than it seems, and consists of placing over the resting mosquito the mouth of a bottle or test tube the bottom of which contains cotton saturated with chloroform. The mosquito flies into the bottle and is overcome. It can be confidently stated that no anopheline mosquitoes breed in camp, and furthermore that the majority of cases of malaria treated were contracted by the men while on liberty or while on duty at the rifle range last year, or from mosquitoes imported from outside the camp limits.

(b) VENEREAL DISEASES.—The prophylaxis used throughout the naval service is in use here. It is enforced and is fairly effective.

(c) TONSILLITIS.—Operation advised to those having enlarged tonsils. The drinking cups in all buildings are kept constantly submerged in a one-half of 1 per cent solution of formalin. This is furnished from the sick bay and is colored by a little fuchsin to avoid substitution of plain water. It has been very effective.

(d) SKIN DISEASES.—Occasional examinations at unstated periods, to prevent concealment. The men are urged to change clothing whenever wet or perspired and to use dusting powder freely. They are given plenty of opportunity to wash their clothing and clotheslines are supplied, the drying of clothing by placing it on the ground being forbidden. The post barber is supplied with a disinfecting solution in which to immerse his razors.

(e) TYPHOID AND DIARRHEAL DISEASES.—The use of distilled water exclusively for drinking purposes. Men going on hikes fill their canteens before starting. Because of its cleanliness the camp is virtually flyless. This is promoted by the prompt collection and incineration of all garbage and refuse; amebic or bacillary dysentery virtually unseen, and but one case of typhoid has developed and that a paratyphoid, not originating in camp. In consequence of the recent order the command will be vaccinated with typhoid vaccine as soon as practicable. All fruit brought into camp is inspected, and none which is spotted or partly decayed may be sold.

(f) ALCOHOLISM.—Is relatively infrequent compared with previous years and is severely discountenanced, persistent offenders being promptly punished and not detailed on duties of preference.

(g) Finally, the men are given plenty of opportunity for recreation and amusement and systematic exercise. Athletic sports are encouraged. They receive from the medical officer a periodic lecture and demonstration on first aid and personal hygiene and are encouraged to take an interest in their personal welfare and the maintenance of good health.

In conclusion, I wish to state that by persistent efforts and punishments, alcoholism among the members of the command, and in consequence unauthorized absences, has been reduced to a minimum. Since a fire destroyed a number near by, there have been no saloons within easy access of the command, to which is attributed a considerable decrease in the monthly punishments. I am of the opinion that could places selling alcoholic stimulants of all kinds be kept a considerable distance from a military post, and if plenty of work and amusement were provided, the liquor question, by far the greatest the service has to face in its efforts toward efficiency, would be largely solved. My experience in this post has led me to believe that the reestablishment of the canteen system would work a decided harm to such a command as this.

SANITARY CONDITIONS IN SAMOA.

[Abstract Sanitary Report, 1911, Tutuila, Samoa.]

By Passed Asst. Surg. E. U. REED, United States Navy.

The number of births reported for the year is 258 and deaths 360. An epidemic of measles swept through the islands and, with its accompanying dysentery, caused many deaths.

2. Many of the deaths are attributed to "devil doctoring," or giving of Samoan remedies, some of which are undoubtedly poisonous, to the sick for the purpose of driving out devils. The inadequacy of the present laws concerning this evil and the difficulty of getting Samoans to testify against the "devil doctors," who are much feared, have seriously handicapped the medical officers in their efforts to punish the offenders. It has even happened, in at least four cases in the last four months, that patients in the Samoan Hospital have been so treated, and in one case the death of the patient was caused thereby. An autopsy could not be obtained and sufficient evidence for a conviction could not be procured.

Every effort to punish such offenses will be made, and a law to prohibit the giving of harmful medicines or treatments and the giving of medicines or treatments for the purpose of driving out "devils" is greatly needed. Authorization is also needed for the performance of an autopsy in every case of death under suspicious circumstances.

3. PREVALENT DISEASES: The most prevalent diseases during the year have been measles, dengue, filariasis, and elephantiasis, tuberculosis, frambœsia, uncinariasis, ascariasis, trichocephaliasis, and Samoan conjunctivitis and its sequellæ.

(a) *Measles*.—On December 23, 1910, the steamship *Dawn*, on which a case of measles had developed, and the steamship *Rob Roy* were placed in quarantine at this port. The contagium was apparently acquired in Vavau, where measles was epidemic. On February 22, 1911, measles was reported epidemic in Apia, German Samoa, and two cases appeared in Leone, Tutuila, both of whom contracted the disease in Apia. From Leone the epidemic spread very rapidly over Tutuila and then to the islands of the Manua group.

Total population, census of 1908, 6,667; cases reported, 2,550; percentage of cases, 38; deaths reported, 219; mortality of epidemic, 8.6 per cent. Since September 1 no cases have been reported. The last preceding epidemic of measles occurred in 1893, and very few of the population escaped infection at that time. Practically all of the cases in this epidemic occurred in persons under 18 years of age. Diarrhea, attributed to errors in diet and intestinal parasites, caused many of the deaths. Bronchitis and tuberculosis have also been very important sequellæ.

(b) *Dengue*.—Since October 20, 1911, an epidemic of dengue has been very prevalent. About 100 cases have been treated by the health officer and 18 cases have occurred among the officers and enlisted personnel of the station, and other cases on the station ship. The epidemic has spread rapidly over this island and is also reported from Manua. No serious cases have reported to the medical officers, and at first the diagnosis was considered doubtful, because of the mildness of symptoms. Later a sufficient number have, under observation, developed the eruption, relapse and characteristic, though moderate, pains in head, back, and limbs to confirm the diagnosis.

(c) *Filariasis*.—Filariasis in its various manifestations is very prevalent, and the majority of the operations are for elephantiasis and abscessus of filarial origin. Tincture of ferric chloride remains the most effective drug for treating the acute manifestations, but it will not cure the disease. Various drugs, including salvarsan, phenocoll, and urotropin, have been tried without success.

(d) *Tuberculosis*.—During the four months since my arrival at this station many cases of tuberculosis of lungs, glands, bones, and joints have been treated at the Samoan Hospital and on trips around these islands. The epidemic of measles seems to have increased the prevalence of this disease, and it is now one of the most serious problems confronting the health officer.

(e) *Frambæsia*.—Since June 22, 1911, 58 cases of frambæsia have been treated by intramuscular injections of salvarsan, with uniformly excellent results. The treponema was demonstrated in 40 cases. One relapse or reinfection has been reported in a child of 2 years, treated in July, 1911, with 0.06 gram salvarsan injected into the gluteal muscles. Eight days after the first injection all lesions were healed. The disease reappeared in November and treponema were demonstrated on December 4, 1911; 0.3 gram of salvarsan was given, and four days later all lesions were practically healed. The present dosage is 0.15 gram for children under 2 years of age, 0.2 gram for 2 to 3 years, and 0.3 gram for 3 to 10 years. In no case have any alarming symptoms been observed, and in only two of the earlier cases has an abscess resulted. The drug is now rendered alkaline with 2 per cent sodium hydrate solution, as recommended by Dr. B. C. Corbus, of Chicago. This enables more accurate clearing of the solution without excessive alkalinity. The pain on injection seems to be lessened by this method, and no abscesses have resulted. In all of the cases continued under observation the yaws lesions have entirely healed in 8 to 10 days, and no other recurrences have been reported.

(f) *Uncinariasis*.—The prevalence of this disease has not decreased to any great extent. It has been estimated that 90 per cent of the adult Samoans harbor this parasite, though not over 10 per cent

show appreciable symptoms. The cases have been treated as soon as discovered, and the ordinance prohibiting the disposal of feces, except in properly constructed latrines, has been enforced as thoroughly as possible. If additional hospital apprentices can be ordered to this station, as will be requested in this report, an active campaign against the disease in the outlying villages will be started. It is planned to have the sanitary inspector and a hospital apprentice visit each village in these islands, spending sufficient time to examine each of the inhabitants and treat the cases of uncinariasis and other intestinal parasites. An attempt was made during November and December of this year to start such a campaign, and the sanitary inspector, with an interpreter, spent 24 days in Leone examining the inhabitants of that village. The pressure of work at this station made it necessary to recall him.

(g) *Conjunctivitis*.—Samoan conjunctivitis, as described by Rossiter, is still very prevalent, though every effort has been made to limit this disease. A supply of protargol, with full instructions for its use, was sent to the chief of each village, and articles were published in the local newspaper about the disease. Since my arrival in August, 1911, I have seen no cases that I could diagnose trachoma, and from my observations I believe that many of the cases so diagnosed have been the results of repeated or long-continued infections with Samoan conjunctivitis, with no treatment except the Samoan one of scraping the eyelids with a piece of coconut shell. All of the early cases and many of the late ones have improved rapidly under instillations of protargol or pyoktanin solutions. Doubt has already been thrown upon the diagnosis of trachoma by Dr. Leber, the German ophthalmologist. He believes these trachoma-like cases to form a distinct disease and named it *epitheliosis granulosa desquamativa*. It is possible that these cases are late stages of Samoan conjunctivitis.

SANITARY CONDITIONS IN GUAM.

[Abstract, Sanitary Report, 1911.]

By Surgeon C. P. KINDLEBERGER, United States Navy.

GENERAL HEALTH.

The general health of the natives is believed to be slowly improving on account of the gradual betterment in hygienic conditions. Realizing that further improvement in the public health will necessarily be gradual and could best be obtained by educating the younger generation, the following elementary course in hygiene was approved by the governor, printed August 4, 1911, and is now a part of the instruction given in each of the public schools of the island:

HYGIENE.

ELEMENTARY COURSE FOR THE PUBLIC SCHOOLS OF GUAM.

1. RULES OF HEALTH: (a) Drinking water from any source except the regular water supply at Agaña, Asan, Piti, and Inarajan should be boiled for at least 15 minutes, allowed to cool, and then kept in a clean, covered receptacle. Boiling destroys the eggs of intestinal worms, the small organism which causes dysentery, and other harmful germs.

(b) All meat, fish, and vegetables should be thoroughly cooked before being eaten, for the same reasons given for boiling drinking water.

(c) Cover cooked and uncooked food, to prevent contamination by dust and flies.

(d) The intestines of fish and animals should be removed as soon as they are killed, and they should be bled freely.

(e) The skin of fruit that is eaten raw should be cleaned with boiled water.

(f) To preserve meat, either cook or salt thoroughly and keep in a cool, dry place.

(g) Do not eat decayed or partly spoiled meat, fish, vegetables, or fruit, as they often cause serious sickness and possibly death.

(h) Wash the hands and face with soap and water three times a day, before eating.

(i) Take a bath every day and always wear clean clothes.

(j) Clothes should be washed with soap and boiling water, and it is recommended that they be dried on lines. Clothes dried on the ground are never thoroughly clean and are frequently the cause of skin diseases, such as dhobie itch.

(k) Do not sleep in the clothes you wear during the day.

(l) Ground itch and consequent hookworm infection is due to working with bare feet and legs in infected soil. To prevent this serious disease, infected soil should be avoided, and the wearing of shoes and stockings is recommended.

(m) Keep houses and the surrounding grounds clean, dry, and free from rubbish, long grass, and weeds.

(n) The teeth and mouth should be kept clean, and it is recommended that a toothbrush be used at least once a day.

(o) Wash cooking utensils, dishes, glasses, and tableware with soap and boiling water after each meal.

(p) Fresh air, sunshine, daily exercise in the open air, and sufficient sleep are essential to health. Keep windows and doors open all day and especially at night when asleep. This renews and freshens the air and removes the contamination caused by perspiration and exhalations from human bodies.

(q) It is recommended that a net be used over the bed at night to prevent mosquito bites and subsequent disease.

(r) It is recommended that everyone sleep on a bed and not on the floor. If you sleep on a mat, the dust from the floor, which is filled with germs, will be inhaled during sleep.

(s) Do not overcrowd the houses; this contaminates the air and is very injurious to health.

(t) Do not sit around in wet clothes; change to dry ones as soon as possible.

(u) Always use the nearest private or public water or dry earth closet. To prevent worm infection and dysentery, do not contaminate the soil under or around your house with fecal matter or urine.

2. CARE OF INFANTS: If babies can not be nursed by their mothers, give them for the first year fresh milk or condensed milk, diluted with boiled water, and boiled water to drink. *Do not give young babies bananas or other fruits, rice, soup, or meat.* The juice of ripe oranges is permissible for babies once a day after they are six months old. Bathe all babies every morning with warm water and soap. Keep their clothes clean and protect them while asleep from flies and mosquitoes by a net. Bring all sick babies and those whose food does not agree with them to the hospital as soon as possible for treatment.

3. **TUBERCULOSIS:** Tuberculosis (consumption of the lungs) is a very common disease in Guam. It is caused by a very minute germ which is found in the sputum and, if dried, in the dust in or around the house. A consumptive should sleep on a bed in an open-air shack, preferably alone, rest as long as he has any fever, bathe daily, avoid getting his clothes wet, always spit in a cup, *never on the ground or floor of his house*; burn all sputum and eat plenty of nutritious food, such as meat, eggs, and milk. Come to the hospital for treatment as soon as you notice a continuous cough, copious night sweats, fever, the spitting of blood, or loss of weight or strength.

4. **GANGOSA:** Gangosa is an inherited blood disease, and its appearance can not be prevented by the patient. Whenever sore throat, ulcers, sores in the mouth or on any part of the body, enlargement of bones, etc., are discovered, you should come to the hospital at once for treatment. By taking continuous treatment as soon as possible after the disease is discovered, it can be cured and the loss of nose, eyesight, voice, and deformity of face, arms, and legs prevented.

5. **LEPROSY:** Leprosy is a loathsome, chronic, incurable disease, caused by a minute germ and probably transmitted by the bite of a bedbug or by personal contact with a case. All known or suspected cases of this disease should be reported to the authorities at once in order that they may be confined in Tumon Colony. To avoid contracting this malady, do not eat, sleep, or live in the same house with a leper or use his clothes or any article belonging to him.

6. **LOCKJAW (tetanus):** Lockjaw is a very fatal disease caused by minute germs which are found in infected ground, around and under houses, and in manure. Disinfect any infected soil and plant and plow for several years to get the poison out of it. This disease follows punctured wounds of any part of the body and infection of the cord of new-born babies. Come to the hospital at once, if wounded, for proper treatment. Cleanliness of person, house, and clothing is a great preventative.

7. **MOSQUITOES:** Mosquitoes are very annoying insects and transmit diseases when they bite you. They breed in swamps, stagnant pools, and in water contained in tanks, bottles, barrels, buckets, etc. To destroy their eggs, it is necessary to fill in or drain the swamps, cover or screen water tanks or barrels, and to empty the water contained in buckets, cans, bottles, etc.

8. **FLIES:** Flies are not only a great nuisance, but carry filth and disease germs on their feet and deposit them on your food and water. They breed principally in garbage and manure. To destroy their eggs, these materials should be collected daily and burned.

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Up to the present time there has been only one small sewer in Agaña, and outside of the public buildings very few houses are connected to it. The new sewer system, upon which work has already been started, will consist of four mains of 8-inch glazed earthenware pipe running about north and south, intersected by two long and three short 6-inch laterals. Automatic flushing tanks will be installed at the upper end of each main sewer and at high points on the principal laterals. Manholes for cleaning are to be provided wherever there is a turn in the sewer—practically at nearly every street corner. The main sewer outlets are to be about 200 feet from shore, where there is enough current running out to sea through a channel in the reef to carry away all sewage. It is expected that many houses in Agaña which now use the pail system will install modern plumbing and connect with one of the new sewers. The people of Agaña who can not

have plumbing should use the proposed public latrines, of which there are to be six. The latrines will all have water-closets for both sexes, provided with automatic flushing tanks, also shower baths. The three along the beach will have a long bench for washing clothes, and water from the regular Fonte River supply, thus reducing the amount of laundry work done in the Agaña River. The one latrine now built has a concrete floor and galvanized-iron walls and roof. The remaining five will be built of reenforced concrete with a roof of galvanized iron.

The water supply of Agaña is obtained from a reservoir with a capacity of 2,561,700 gallons, formed by a concrete dam across the Fonte River in the hills near the wireless station. The watershed, owned by the Government, consists of 350 to 400 acres of land to the westward of the dam. The dam and spillway are 397 feet above sea level. The water is conducted by gravity through a pipe to the distributing reservoir situated on a hill back of Agaña at a height of 200 feet above sea level. Free public hydrants are located in all parts of the town for the benefit of those whose houses have no water connection.

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The towns of Asan, Piti, and Ynarajan each have a small independent water supply. Sinajaña, a village of 225 inhabitants about 1 mile from Agaña, has been provided with a 2½-inch water-pipe line. It is proposed also to install a latrine there similar to those in Agaña, but provided with a septic tank instead of sewer connection. Work is now proceeding on a water system for Merizo, a town of 650 inhabitants. A concrete dam has been built across a near-by stream to form a reservoir. From this dam a 3-inch pipe is being laid and will be connected with six public hydrants. The town of Umatac, whose population is 300, will also have a water supply in the near future with a 3-inch pipe and about six street hydrants. The town of Sumay, population 850, has not yet been provided with a water system, as the nearest supply is about 5 miles away and there is not enough money available at present for this expensive work.

The garbage, feces, manure, and refuse of the houses and streets of Agaña are collected every day except Sunday by a contractor who uses four carabao carts with small boys as drivers. The inflammable refuse is burned in two "rock pile" incinerators located on the beach, one of which was constructed during the year. The new one has an iron smoke pipe, and both are protected from rain by a galvanized-iron roof and circled by a cement platform. Noninflammable refuse, such as bottles, cans, etc., is carried out in a scow and dumped overboard outside the reef when the weather permits. The above contract system is expensive and not very satisfactory, as the carabaos

are entirely too slow and the boy drivers not strong enough for the work. Two carts have been bought by the island government for this purpose, and after July 1, 1912, it is proposed either to let a new contract, the Government furnishing the carts, horses, and probably drivers, or to let the public works department do the work and charge the cost to the island government.

Public latrines, with shower baths and facilities for washing clothes, should be constructed in each small town having a water supply and not already provided. "Rock pile" incinerators should also be built in these villages for the destruction of feces, garbage, and other objectionable refuse.

The public buildings in Agaña are kept clean and in a sanitary condition. The public schools and the court house and jail have semi-modern plumbing and are connected with the old sewer; they will be connected with the new sewer system as soon as it is completed, and it is hoped that the plumbing will then be completely modernized. The large number of mosquitoes and flies on the island have not been identified as yet, though of the former, *Culex* and *Stegomyia* appear to predominate. The following information on this subject was obtained from the Guam Agricultural Experiment Station, belonging to the United States Department of Agriculture: "Mr. David T. Fullaway, entomologist at the Hawaii Agricultural Experiment Station, was detailed by the Secretary of Agriculture for a few months' duty in Guam and while here made a collection of the flies and mosquitoes. This collection was forwarded to Dr. L. O. Howard, chief of the Bureau of Entomology, United States Department of Agriculture, for identification and return. Upon the receipt of these identifications, a copy of the same will be forwarded to you. While here, Mr. Fullaway also arranged for the introduction from Honolulu of the fly parasite, *Spalangia cameroni*, the larvæ of which feed upon fly puparia. These parasites have been bred in a battery jar at this station, four broods having been reared from the pupæ of flies which feed during their larval stage in horse and carabao manure." There is an extensive area of land to the southeast of Agaña located on either side of the Agaña River, in which countless mosquitoes breed. This area can not be drained, as it is practically at the sea level, and is usually amply supplied with water, both from the river and rains. Filling this area is also impracticable, on account of the great expense involved. During the rainy months many sections of Agaña are flooded by the rain itself and by the overflow from the river.

During the year 3,594 natives were admitted to the naval hospital and the "ward for special patients," as supernumeraries, for the diseases noted below—3,551 were returned to their homes cured or greatly benefited by treatment and 43 died.

* * * * *

TUBERCULOSIS: About one-sixth of the adult population of Guam have pulmonary tuberculosis, and many of the children have glandular tuberculosis. These cases are given treatment at the native clinic. They are urged to sleep in the open air, given directions as to food, clothing, and manner of life, and are cautioned in regard to expectoration and the destruction of sputum. During the rainy months the climate of the Island is unfavorable for consumption and the Chamorros have a lessened resistance to this disease, due principally to anemia caused by intestinal parasites. The people generally are afraid of night air and evil spirits and consequently will not sleep with their windows open. A few have built open-air shacks with elevated floor and roof, but no sides. The natives sleep on the floor on mats and usually the houses are overcrowded, as many as 14 people having been counted in one small room. The sputum is generally profuse, due to the habit of chewing betel nut, and is frequently expectorated on the near-by wall or floor. There were 53 deaths from this disease, a percentage of 18.9 plus. A recommendation was made recently to the Governor to construct a special hospital for tubercular natives on one of the hills back of Agaña from a portion of the appropriation "Care of lepers, etc." It is hoped that its site will soon be selected and the building started. If the natives can be induced to report for treatment early enough, the above sanitarium will, it is believed, be of great benefit in checking the ravages of this insidious and fatal disease.

INTESTINAL INFECTIONS AND PARASITES: Practically every native of Guam is infected with one or more intestinal parasites. The treatment of children for hookworms is compulsory. Agaña children from 2 to 12 years of age and children of school age (6 to 12), from Anigua, Asan, Piti, Dededo, Sinajaña, Sumay, Agat, Umatac, Merizo, and Ynarajan, are given treatment for two weeks at a time, about twice in every year, in the naval hospital and "ward for special patients." On entering the hospital, calomel and santonin are given. Early the next morning salts are administered and later a breakfast of coffee and crackers is allowed. A specimen of stool is then sent to the laboratory for examination. At 4 p. m. thymol is given in capsules; no lunch or dinner is allowed, but the patients can drink all the water they want. The children are put to bed soon after receiving the thymol. On the third morning a dose of salts is given at 6 a. m., and at 10 a. m. a dose of santonin. A full diet, consisting of morning coffee, bread, meat, and rice, is allowed on the days when santonin is given. The principle of the treatment is thymol and starvation every other day and santonin and a full diet on the alternate days. To avoid the possibility of thymol poisoning, no visitors are allowed to see the patients on days when this medicine is administered. So far there have been no true cases of thymol poisoning, but occasion-

ally more or less gastritis is caused by this drug. The results of this treatment so far have been most encouraging, as the children are noticeably less anemic, brighter, stronger, and more playful than before. Before the young patients leave the hospital the stools are again examined and the results are recorded.

Amœbæ are fairly common and frequently fatal in children. Dysentery cases are not so severe as those seen in the Philippines, and the number has decreased since waterworks have been established in Agaña and in some of the smaller towns. Gastro-enteritis, due principally to faulty feeding, indigestible food, and fish poisoning, is common and was the cause of 32 deaths. The following intestinal parasites have been discovered:

1. *Ankylostoma duodenale*; 2. *Necator Americanus*; 3. *Ascaris lumbricoides*; 4. *Trichuris trichiura*; 5. *Entamœba histolytica* (fairly common); 6. *Balantidium coli* (not common); 7. *Strongyloides stercoralis* (not common); 8. Flagellates (probably trichomonas, not common); 9. *Oxyuris vermicularis* (rare).

NOTE.—Tapeworms are not found on the island. The one case admitted, a Japanese from a schooner in the harbor, was infected prior to his arrival.

GANGOSA: Three hundred and thirty cases of this disease are known and recorded in the official card index. During the year nine new cases were discovered and nine died; thirteen patients have open lesions at present—four in Agaña, one at Asan, one at Piti, three at Merizo, one at Umatac, and three at Ynaranjan. These open lesions are principally small ulcerations on legs and arms which at times heal and later break down. Though therapeutically gangosa cases have responded to mixed treatment, and the disease is officially recorded here as syphilis, it is believed that its exact cause and origin has not yet been satisfactorily proven. The medical officers formerly on duty in Guam were apparently convinced that the disease was syphilitic in origin. In support of this theory, Surgeon H. E. Odell, United States Navy, has written an article which appeared in the last number of the United States Naval Medical Bulletin. Asst. Surgeon G. B. Crow, United States Navy, during March and April, 1911, examined the blood of 100 cases by Emery's modification of the Wassermann test and obtained the following results: Positive, 75 per cent; partly and slightly positive, 10 per cent; negative, 15 per cent. Asst. Surgeon E. P. Halton, United States Navy, has recently examined the blood of 281 gangosa patients, using Noguchi's modification of the Wassermann test. His results are as follows: Positive, 105; negative or weakly positive, 176. Dr. Halton, from a study of this disease for the last seven months, has come to the conclusion that it is probably a sequel of yaws and is not syphilitic in origin. His reasons for this conclusion, briefly stated, are as follows:

1. As high a percentage of positive results in yaws as in syphilis.
2. Yaws endemic among Chamorros.
3. Majority of gangosa patients have had more or less severe yaws.
4. Absence of syphilitic manifestations among the gangosa cases seen by him; no interstitial keratitis, cord disease, Hutchinson's teeth, etc.
5. Absence of miscarriage among the women.
6. Absence of syphilitic lesions in the internal organs of several cases examined by him post-mortem and in others inquired into.

Dr. Halton examined the blood in 11 cases of yaws, by the Noguchi modification of the Wassermann test, and found that all were positive. Twenty-four cases that had had yaws several years ago were also examined by the same test with the result that 11 were found to be positive and 13 negative.

LEPROSY: Twenty-five lepers were secluded in Tumon Colony, on January 1, 1911, all positive bacteriologically: Admitted during 1911, 1; died during 1911, 2; remaining December 31, 1911, 24 (19 men, 5 women). Ten lepers were given full doses, grams 0.2 to 0.6, of salvarsan ("606") intravenously, by Asst. Surgeon W. M. Kerr, United States Navy, in charge of the colony. No results were noted except in a case having gangosa, whose lesions were quickly healed and in a case of yaws, in which a like result was obtained.

To prevent lepers from leaving the colony at night, iron bars were placed over the windows of each house and padlocks on the doors. The patients are locked in by the superintendent at 9 p. m. every night. A complete physical examination of each case was made by Dr. Kerr and a careful history taken. From the data so collected, a record of each patient was typewritten on a printed form and will be filed as permanent station records, together with a recent photograph of each leper which shows as many of the lesions as possible. The lepers keep their houses and surrounding grounds fairly clean but are not able to do any hard work. A few of them have cleared small patches of ground and planted corn, melons, and tobacco. The weekly Government ration supplied each patient consists of 2½ pounds of fresh beef, 2 cans of salmon, 1 can of corned beef, 4 ounces of coffee, 4 ounces of sugar, 5 pounds of rice, and 21 pieces of hard-tack. This diet is supplemented by fresh fish caught in Tumon Bay and by fowls and vegetables raised in the colony. The clothing worn by the lepers is made by their relatives from material supplied by the Government. The inclosure is surrounded by a barbed-wire fence, except on the ocean side, and at night a native guard makes his rounds every two hours for the purpose of preventing the lepers leaving or their relatives entering. All the relatives of each leper have been examined, but no new cases found. For the benefit of the island, I have to renew the recommendation made by my predecessor that the lepers be sent from Guam to the island of Culion, in the Philippines. As leprosy is practically an incurable disease, and all cases must be

strictly isolated till death, neither family ties nor sentiment should interfere with their transfer to a climate and environment nearly similar to the one they are accustomed to. As long as the lepers remain on this island, the disease is likely to continue and they constitute a grave menace to the general health. In spite of watching, some of them probably manage to get through the barbed-wire fence surrounding the colony to visit their friends and relatives. The blood of 24 lepers was examined by Asst. Surgeon E. P. Halton, United States Navy, by the Noguchi modification of the Wassermann test, with the following results: Positive, 11; weakly positive, 8; negative, 5.

INSANE: Two insane persons, a man and a woman, are confined in separate buildings on the Tumon Reservation. The former has improved, and is allowed to work around the grounds; the latter is considered incurable.

EPIDEMIC ASTHMA (Guha): This disease usually appears about the end of October. In children the symptoms resemble those of bronchopneumonia, in adults asthma. It is most fatal in early life. The treatment is symptomatic and a causative organism has not been discovered. The total number of cases under treatment in 1911 was much smaller than the total number seen in 1910. The almost universal worm treatment may have been the cause of this decrease.

FRAMBOESIA (Yaws): Two patients with yaws were admitted to the hospital during the year. This disease is fairly common among the natives, but the cases have decreased under improved hygienic conditions. The lesions in subacute yaws respond quite rapidly to cauterization by 50 per cent solution of silver nitrate. About 20 subacute cases were treated at the native clinic during the year. Internally potassium iodide or mixed treatment is given when necessary, and these drugs are as efficient in this disease as in syphilis.

FILARIASIS: Up to the present time, the *Filaria Bancrofti* has been found in the blood of 11 cases and there is 1 known case of elephantiasis, a negro who had the disease before he arrived here.

DENGUE: Eighty-three enlisted men and 28 natives were admitted with dengue during the year. The cases first began to appear in January, shortly after the return of the U. S. S. *Supply* from the Philippines. A number of other enlisted men and a large number of natives had mild attacks of the disease at the same time, but were not admitted to the sick list.

MALARIA: No cases of this disease are known to have originated on the island, and no anopheles mosquitoes have been discovered.

PUBLIC WOMEN: There are at present 14 public women in Agaña. They are examined once a week for venereal disease, and if infected are placed in the locked ward under the south end of the "ward for special patients" and given treatment until well.

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VOL. 6

NO. 4

UNITED STATES NAVAL MEDICAL BULLETIN

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UNDER THE SUPERVISION OF
SURGEON GENERAL C. F. STOKES
U. S. NAVY

EDITED BY
SURGEON T. W. RICHARDS, U. S. NAVY
AND
PASSED ASST. SURGEON J. L. NEILSON, U. S. NAVY

OCTOBER, 1912

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This United States Naval Medical Bulletin is published by direction of the department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.

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P R E F A C E .

The publication and issue of a quarterly bulletin by the Bureau of Medicine and Surgery contemplates the timely distribution of such information as is deemed of value to the medical officers and the Hospital Corps in the performance of their duties, and with the ultimate object that both shall continue to advance in proficiency in respect to all of their responsibilities.

It is proposed that the Naval Medical Bulletin shall embody matters relating to hygiene, tropical and preventive medicine, pathology, laboratory suggestions, chemistry and pharmacy, advanced therapeutics, surgery, medical department organization for battle, and all other matters of more or less professional interest and importance under the conditions peculiar to the service and pertaining to the physical welfare of the naval personnel.

It is believed that the corps as a whole should profit, to the good of the service, out of the experience and observations of the individual. There are many excellent special reports and notes beyond the scope of my annual report being sent in from stations and ships, and by communicating the information they contain (either in their entirety or in part, as extracts) throughout the service, not only will they be employed to some purposes as merited, but all medical officers will thus be brought into closer professional intercourse and be offered a means to keep abreast of the times.

Special attention will be given by the instructors of the Naval Medical School to the review of advances in medical science of special professional interest to the service, as published in foreign and home journals, and extracts from these will appear in the bulletin, together with such remarks as the instructors may deem of value to officers on foreign service or sea duty.

Information received from all sources will be used, and the bureau extends an invitation to medical officers to prepare and forward, with a view to publication, matter on subjects relating to the profession in any of its allied branches. But it is to be understood that the bureau does not necessarily undertake to indorse all views and opinions expressed in these pages.

C. F. STOKES,
Surgeon General, United States Navy.

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U. S. NAVAL MEDICAL BULLETIN

VOL. VI.

OCTOBER, 1912.

No. 4.

SPECIAL ARTICLES.

A DESCRIPTION OF RECENT HOSPITAL CONSTRUCTION IN THE UNITED STATES NAVY.

By Surgeon A. W. DUNBAR, United States Navy.

The past 15 years has been a period of great expansion in the United States Navy, shared by all branches alike. In 1893 the entire personnel of the Navy and Marine Corps did not exceed 10,500. To-day the average strength is over 61,000 men and officers.

The naval stations have been augmented by the establishments at Port Royal, S. C.; Charleston, S. C.; Port Algiers, La.; Newport, R. I.; Yerba Buena, Cal.; Puget Sound, Wash.; and the Naval Training Station, Great Lakes, Ill., all within the continental limits of the United States. The Spanish-American War, thrusting upon our country additional responsibilities beyond the seas, has necessitated naval bases at Cavite and Olongapo, P. I.; Honolulu, Hawaii; Guantanamo, Cuba; and on the islands of Guam, Tutuila (Samoa), and Porto Rico. The rebuilding of the Naval Academy and the increase in the number of midshipmen has required the construction of a hospital of adequate size and in keeping with the architecture of the academy.

Each and every one of these stations requires a hospital building of a more or less pretentious nature, depending not alone upon the number of the personnel of the station per se, but also upon its importance as a strategic point for the mobilization of the naval forces in warfare. Stations now of apparently slight value may, through the evolvement of strategical plans incident to the approaching opening of the Panama Canal, become of great importance. Hence it may readily be seen that naval hospitals should be so designed as to be capable of extensive expansion in their bed capacity.

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Coincident with this growth of the Navy, there has been a great advance in sanitary science, in surgery, and in medicine in general. The growth of the specialties, each requiring its own peculiar appliances, has been so remarkable that the well-equipped modern hospital contains an armamentarium scarcely dreamed of by the profession of 20 years ago.

It is easily realized that the 12 naval hospitals of 1894, with a total capacity of 823 beds, built to meet the requirements of the service and the existent ideas of hospital construction during the middle of the last century, were inadequate in size, obsolete in construction and equipment to meet present conditions.

These hospitals were located as follows: Widows Island, Me.; Portsmouth, N. H.; Boston, Mass.; Brooklyn, N. Y.; Philadelphia, Pa.; Washington, D. C.; Annapolis, Md.; Norfolk, Va.; Pensacola, Fla.; Mare Island, Cal.; Sitka, Alaska; and Yokohama, Japan. These hospitals were so thoroughly and accurately described by Passed Assistant Surgeon (now Medical Director) J. D. Gatewood, United States Navy, in his "Notes on Naval Hospitals," published in 1893, that no further detailed description of them will be attempted.

Of these hospitals, two have been dropped from the list, i. e., Widows Island and Sitka, Alaska. The Widows Island Hospital, intended for the isolation of yellow-fever patients, was rendered unnecessary through modern sanitary science, and in 1901 was ceded back to the State of Maine. That at Sitka, Alaska, was abandoned for hospital purposes in March, 1912, and will probably be transferred by executive authority to the Territorial government for use in the department of education.

The Naval Hospital, Washington, D. C., was moved into a new building at the foot of Twenty-fourth Street NW. in October, 1906, but the old building was utilized for certain types of cases until September, 1910, when it was discontinued for hospital purposes. From this time to May, 1911, when it was abandoned, the building was used as a training school for hospital apprentices. An effort has been made to sell the property, but the necessary legislative authority has, as yet, not been obtained. The Pensacola Hospital was closed in September, 1911.

Among these 12 hospitals several plans of hospital construction may be found, as the block, the corridor, and the pavilion hospital, represented by the Brooklyn and Norfolk Hospitals, the Portsmouth, the Philadelphia, and Mare Island Hospitals, respectively. The hospitals at Boston and Washington may be said to have been constructed on no recognized plan whatever.

The buildings utilized as hospitals at Sitka, Alaska; Pensacola, Fla.; and at the Naval Academy did not deserve the name.

In order to preserve the sequence of events in the renovation, reconstruction, and rebuilding of the naval hospitals, it is proposed to give a brief history of each from 1893 (the last year covered by Medical Director Gatewood's article) up to the present time.

NAVAL HOSPITAL, PORTSMOUTH, N. H.

The three-story brick hospital erected in 1890 will soon be replaced by a new one which is now about 96 per cent completed. This hospital has been continued in service with but few additions or improvements, and, until 1898, when the prisoners of war from Cervera's fleet were sent to Seaveys Island pending their release, its accommodations for 3 officers and 26 enlisted patients proved ample for the needs of the station. At that time temporary wooden pavilion wards were erected in front of the hospital.

In 1900 the construction of a dry dock and the erection of shops in close proximity to the wards produced an undesirable environment for a hospital, and the establishment of a naval prison and the increased activity at the navy yard have rendered a larger hospital necessary.

A reservation occupying a rocky promontory 38 feet above mean low water and about 2,500 yards southeast of the center of the navy yard was assigned as a site for the new hospital. The hospital is building under the same contractor and under the same general plan as those at Chelsea, Mass., and at the training station at Narragansett Bay, R. I.¹ The hospital faces the southeast, giving the operating department a northern exposure and the wards a desirable southern outlook. While at present the construction of the main hospital building only has been authorized, the complete plan contemplates the building of three sets of quarters for the medical staff, a contagious ward building, quarters for members of the navy nurse corps, a stable, and a laundry. The original idea of erecting a power plant has been abandoned and light, heat, and power are to be taken from the central navy yard power station at a great reduction in the original estimated cost, the cost of installation of conduits, etc., being about \$23,000. The cost of the present construction, as taken from the Noel Construction Co.'s contract is \$289,585, which is defrayed from the naval hospital fund.

The capacity of the hospital will be 104 beds in the wards, 16 in quiet rooms, and 14 beds for sick officers, a total of 134. The wards are designed, however, so that another row of cots can be extended down the center of each, increasing the capacity, without undue crowding, by 10 or 12 beds.

¹ Ed. Newport, R. I.

NAVAL HOSPITAL, NARRAGANSETT BAY, R. I.

The original hospital was a building formerly used as a pesthouse by the city of Newport. In 1894 Congress appropriated \$20,000 for the construction of a hospital at this station, the building being erected by and under plans prepared by the Bureau of Navigation. This was transferred to the Bureau of Medicine and Surgery, September 29, 1896. It consisted of a three-story central building with two single-story wings, with a 12-bed ward in each wing. In the central building was the kitchen, mess room, toilets, quarters for a medical officer, and six rooms for sick officers. Subsequent to the transfer two of the latter rooms were converted into an operating room and a laboratory.

The hospital occupies a small reservation on the northeast corner of Coasters Harbor Island, on which the training station is located. The appropriation for the fiscal year 1898 (naval act of May 4, 1898) contained an appropriation of \$6,500 for the erection of a building for contagious cases, containing 24 beds, which was completed in the same year. An appropriation of \$20,000 (naval act of June 7, 1900) was made in 1900 for additional wards. This amount was insufficient, and \$20,000 additional was made available in 1901 by the naval act of March 3 of that year. Three pavilions were built, radiating from the central part of the hospital. The middle one contains the heating plant, laundry, bag and hammock room, kitchen, and a mess room, with accommodations for 64 patients. The other two pavilions (one of which is two-storied, with rooms for civilian employees on the upper floor) contain wards of 18 beds each. In the lobby at the junction of these pavilions and the older structure is a dressing room, quarters for a junior medical officer, toilets, and five rooms for Hospital Corps men or nurses. A small building with five beds was built between the main hospital and the contagious ward. With this construction the normal capacity of this hospital is 84 beds for enlisted men and 4 for officers, but, owing to the rapid growth of the station and the presence of the Atlantic Fleet during the summer maneuvers the hospital has been overcrowded and is returned as having a total capacity for 102 patients.

This hospital has never been satisfactory. The original design was faulty. The additions made are at a lower level, there is no basement, the ventilation and heating systems are poor, and the flimsy construction requires frequent repairs. These conditions and the need of greater accommodations for the sick has necessitated the erection of a brick hospital of the "type naval hospital" plan. Owing to the lack of room on Coasters Harbor Island and the close proximity of the target range to the present hospital reservation, the location of the new hospital on the mainland has been necessary. In

1910 the Hunter and Maitland tracts, situated on the mainland about a mile from the training station and containing about 13.13 acres, were purchased at an aggregate cost of \$48,550, allotted from the naval hospital fund. The reservation faces on Narragansett Bay and has an elevation of 10 to 20 feet. At the present time condemnation proceedings have been completed for the acquisition of about 5 acres of property adjoining the reservation. The construction of the main hospital was commenced in 1910 by the Noel Construction Co., to cost \$279,411, appropriated from the naval hospital fund, under the same contract as the Chelsea and Portsmouth Hospitals. The hospital faces the west and the bay. Future construction will consist of a power house with the laundry and disinfecting plant, a contagious-disease building, three sets of medical officers' quarters, quarters for members of the navy nurse corps, a stable, and a greenhouse.

NAVAL HOSPITAL, CHELSEA, MASS.

The hospital building constructed in 1836 and extended in 1862 has been continued in service.

Until 1896 expenditures on this hospital were limited to minor repairs. At the above date a modern operating room and a bacteriological and chemical laboratory were fitted up. In 1899 a kitchen annex was built and a general renovation of the hospital made at a cost of \$28,960 under an appropriation by Congress of \$45,000. (Naval act, Mar. 3, 1899.)

The annex was built of brick and granite and gives space for the kitchen on the first and for toilets on the second and third floors, being connected with the rear of the corresponding floors of the hospital by corridors. In 1907 two sets of quarters for junior medical officers were erected between the medical director's residence and the hospital, the cost being \$19,127, under a special appropriation of \$20,000. (Naval act, Mar. 3, 1905.) After tentative plans were considered for the reconstruction of this hospital on modern lines, it was decided that it would be more economical to erect a new structure, reserving the old building for use as a contagious hospital and quarters for the nurses and attendants. Accordingly the contract was let in 1908, coincidentally with those for the Portsmouth and Narragansett Hospitals, for the erection of a building on the "type" plan. This hospital is now under construction and is located 110 feet above the sea level, facing the southeast and the Mystic River, about 400 feet to the northward of the old building. Upon the completion of this contract and the refitting of the old building the present isolation building, stable, and other outbuildings, which are greatly deteriorated, will require removal. The old building has accommodations for 4 sick officers and 100 enlisted patients. The new hospital

will have 14 beds for officers and 120 for enlisted men. The total cost will be \$278,104, which has been allotted from the naval hospital fund.

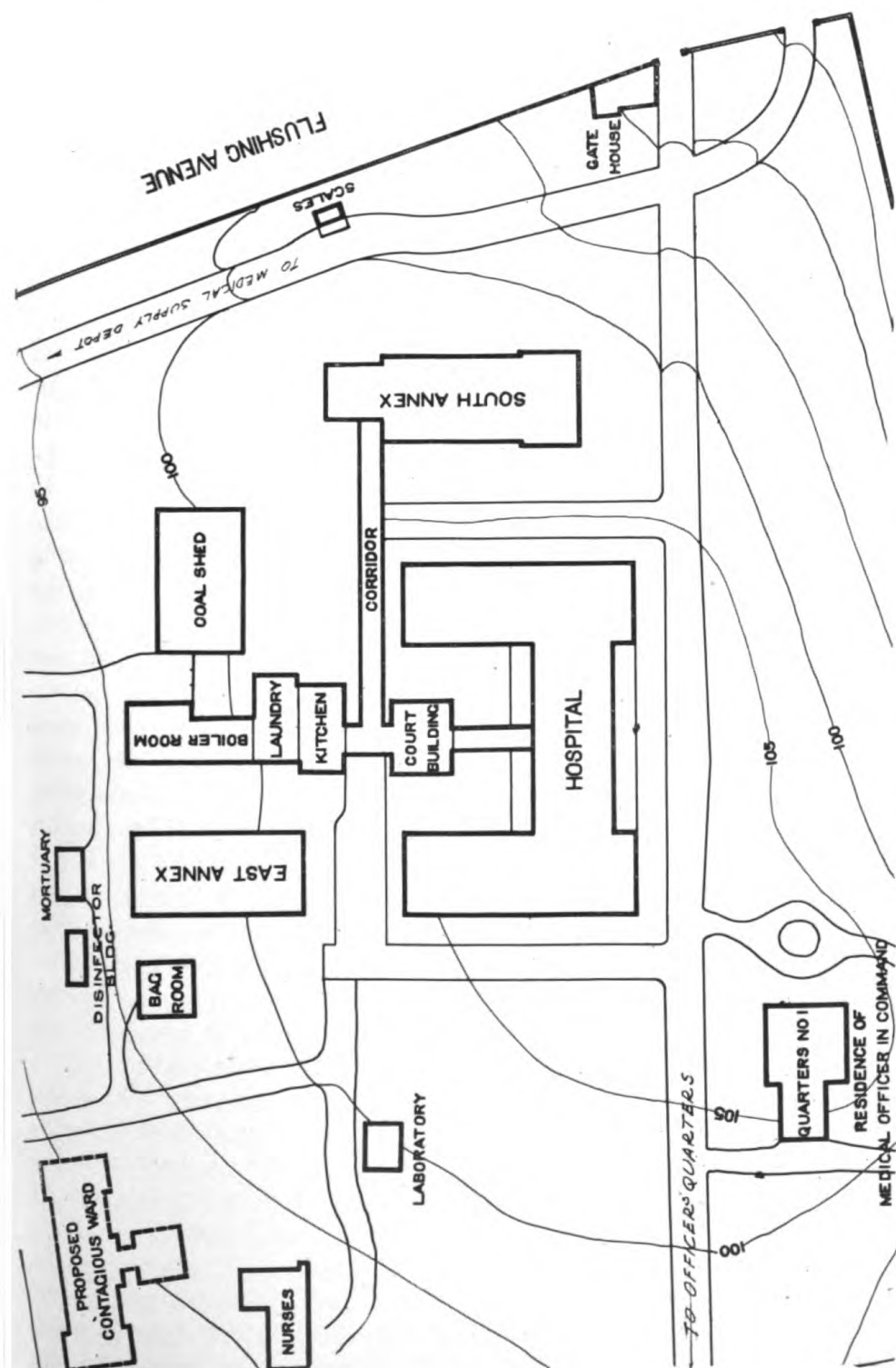
A granite building erected upon the tract loaned to the Bureau of Ordnance in 1865 and returned to the Bureau of Medicine and Surgery in February, 1911, is to be utilized as a power plant and laundry.

NAVAL HOSPITAL, NEW YORK, N. Y.

This hospital, formerly known as the Brooklyn Hospital, was erected in 1838. It is on the block-corridor plan and is a basement, two stories, and an attic in height. The frontage is toward the west: the wings, extending to the rear from the ends of the main building, inclose a court open to the east. The construction, characteristic of the period when built, is massive blocks of Sing Sing marble. The reservation, formerly containing about 33 acres, was decreased in 1890 by the sale to the city of Brooklyn of about 17.75 acres, the proceeds, \$92,000, being credited to the naval hospital fund. In 1894 \$119,000 was allotted for the renovation of this hospital, the erection of an annex for two wards, a subsistence and operating building, and a kitchen. Owing to the impracticability of securing Sing Sing marble, which had been specified for the new construction, the work was delayed to obtain congressional assent to the use of buff brick.

The ward annex, known as the "south" building, was completed in 1897. It is located parallel to and about 60 feet from the south wing and fronting on the same line as the main hospital. The dimensions are 51 feet 8 inches by 183 feet, the height two stories and a basement. Each floor has a 44-bed ward, 2 rooms and a bath, a nurse's room, and ward toilets. No diet kitchen or food elevators were provided, but the installation of a diet kitchen has been decided upon and will soon be completed. In the rear the first floor is connected with the south wing and the subsistence building by a glass-inclosed corridor 15 feet wide. This affords ample solarium and recreation space for the patients. The direct-indirect method of steam heating is employed. An exhaust fan and steam coils in an uptake in the attic is provided to assist ventilation, but apparently little use is made of the former. The large size of the wards in this building is undesirable for administrative purposes and in excess of the utilities provided.

The subsistence and operating building was, inadvisably, erected in the court, a location which interferes with its own ventilation and illumination as well as that of the main hospital. The main mess room is located in the basement, the dispensary and chapel on the first, and the operating room and its accessory rooms on the second floor. The operating room, while not up to the most recent ideas



UNITED STATES NAVAL HOSPITAL RESERVATION, NEW YORK, N. Y.

The hospital faces west. The Naval Cemetery lies 100 feet east of the proposed contagious building and the Naval Medical Supply Depot lies 150 feet east of the coal shed.

in luxury of finish, is modern and well adapted to all requirements. This building is connected with the main hospital by corridors.

The kitchen annex is in the rear of the above, and while an improvement over the former kitchen located in the main hospital building is deficient in conveniences required in an institution of this character.

The changes in the main building consisted of tiling the lower corridor and lobby, laying new flooring on the second floor, installing an electric elevator, and providing additional toilets in connection with the rooms for sick officers. The improvements were completed in 1897, rendering this institution by far the best equipped naval hospital during the Spanish-American War.

In 1903, in pursuance of the policy of providing quarters for the hospital staff outside of the main hospital buildings, the sum of \$20,000 was appropriated by Congress (naval act, Mar. 3, 1903) for the construction of two houses. These were erected adjacent to the residence of the medical officer commanding, and when completed, in 1905, rendered the rooms in the hospital, formerly occupied by the medical officers, available for other purposes.

The building in the rear of the north wing, originally a part of the hospital and occupied for many years by the naval medical supply depot, has been remodeled into a four-ward central corridor hospital complete in every detail. The basement contains 4 airy and well-lighted cells, a lounging and amusement room, a hydrotherapeutic room, storerooms, and toilets. The two floors above are traversed by a central corridor, the one on the first floor connecting with the main kitchen by a corridor. Each floor has a ward on either side of the central hall, those on the first having seven beds each, on the second eight beds each. In connection with each ward is a quiet room, a diet kitchen, a medicine and dressing room, nurses' room, a toilet, and a dumb waiter.

This has proved an excellent addition to the hospital, providing 35 beds at an average cost of \$770. The expense incident to this work was defrayed from the naval hospital fund.

The old isolation building for infectious diseases, located to the northeast of the hospital, has been altered into quarters for 9 nurses, a sitting room, and a kitchen.

At the present time this hospital has accommodations for 10 sick officers and 220 enlisted patients. New plumbing and a diet kitchen are being installed in the main building, which will render the sick officers' rooms more desirable, but it is doubtful whether any renovation less extensive than that instituted at the naval hospitals at Norfolk and Philadelphia will satisfactorily modernize this building. Tentative plans to reconstruct this institution when funds are available have been made.

These plans contemplate the removal of the "court" building and the erection of a subsistence and operating building well to the rear of the court and a power plant in the rear of this. If more accommodation for patients is required the erection of a building similar to the recently remodeled structure in the rear of the north wing, located symmetrically with it, in the rear of the south wing, is proposed. By means of connecting galleries this would make an arrangement convenient for administration.

In 1911 the house formerly occupied by the medical officer in command of the naval medical supply depot was converted into a contagious-disease building and separate structures were erected for a mortuary and a disinfecting plant.

NAVAL HOSPITAL, PHILADELPHIA, PA.

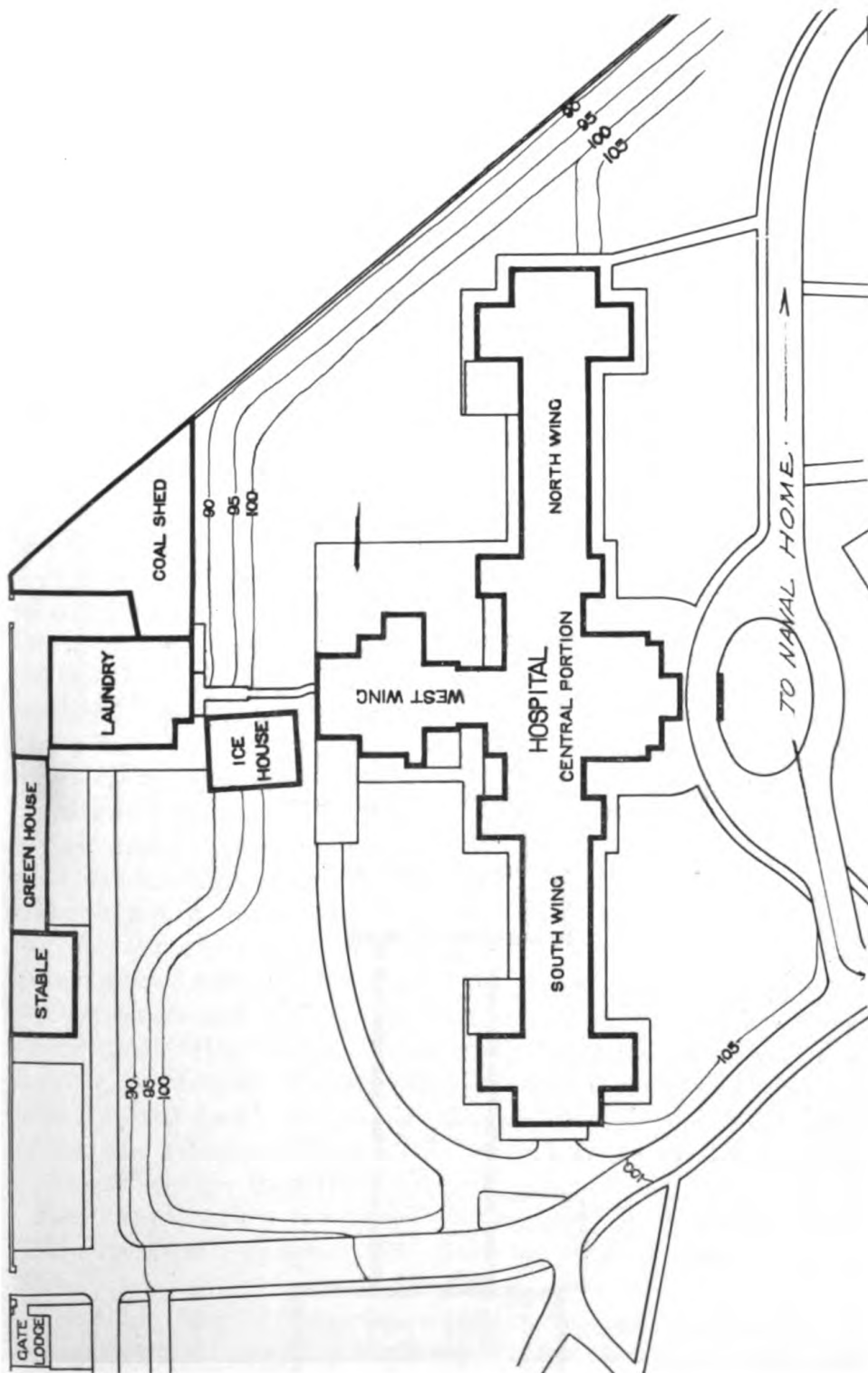
This hospital, under construction during the years 1866, 1867, and 1868, commissioned in 1868, and costing \$72,500, receives patients from the navy yard, League Island, and is also the infirmary for the Naval Home.

The material is brick, the plan that of a pavilion hospital, originally having a central administration portion and lateral wings of two and one-half stories and a rear annex of one story. The building fronts southeast, the wings running northeast and southwest. The environment is undesirable, the hospital being somewhat in the rear of the Naval Home and in close proximity to coal yards and factories. In 1895 improvements tending to modernize this institution were initiated, such as fitting up an operating room and a laboratory, providing a water sterilizer, and installing electric lights. Subsequent to the above date and up to 1910 only minor repairs were made. The League Island Navy Yard has been comparatively inactive up to a recent date and the number of patients admitted to the hospital was small.

The advisability of erecting a hospital at the navy yard was under consideration for a number of years, but it was finally decided to remodel and extend the original building, for which purpose \$200,000 was allotted from the naval hospital fund. This reconstruction, now finished, has added one story to each part of the building and a solarium at the end of each ward, the entire work costing nearly \$158,000.

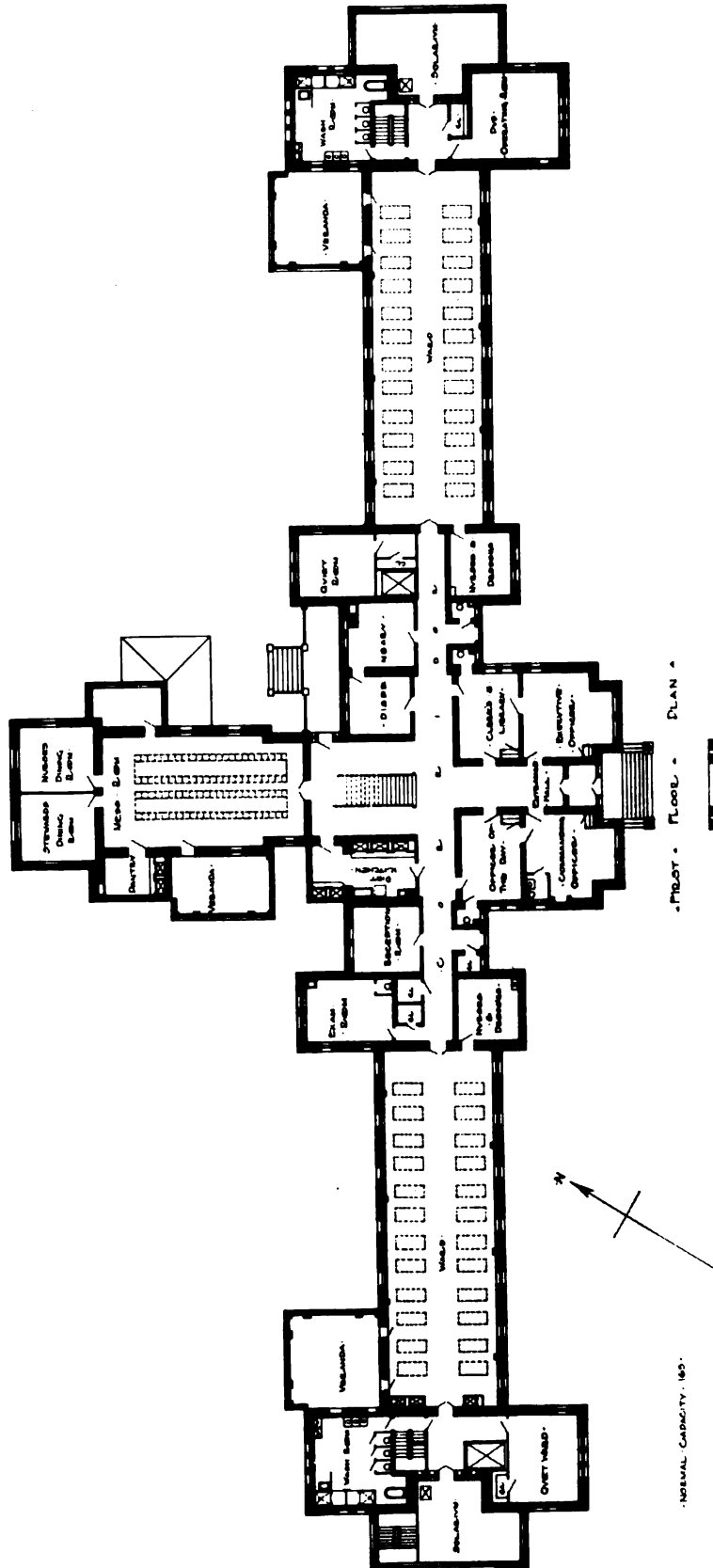
Modern systems of plumbing, heating, ventilating, and electric wiring have been installed and the interior finish entirely renewed. For economical reasons the power plant has been consolidated with that of the Home.

As rebuilt, the general plan conforms closely to that of the "type" naval hospital. The basement is fitted for quarters for male employees, smoking rooms, cells, toilets, storerooms, a well appointed



UNITED STATES NAVAL HOSPITAL RESERVATION, PHILADELPHIA, PA.

The hospital faces southeast, the Naval Home being 250 feet to the south, and quarters of the medical officer in command 550 feet southwest.



1st Floor - PLAN

NORMAL CAPACITY - 100'

UNITED STATES NAVAL HOSPITAL, PHILADELPHIA, PA.

hydrotherapy suite, and the mortuary and autopsy rooms. The main kitchen, cold-storage, and serving rooms are in the basement of the rear annex.

The offices for the medical officer in command, the executive surgeon, officer of the day, and record clerks, constituting the administrative staff, are in the vicinity of the main entrance to the first floor of the main or central building. In the rear of these is the dispensary, reception room, diet kitchen, an examination or board room, and in the rear annex a large mess room for convalescents and dining rooms for the attendants. On the second floor of this part are six bedrooms for officers, two dining rooms, a diet kitchen, a dressing and nurses' room, and toilets. The corridor on this floor opens on the roof over the porte-cochère, which may be used for recreation or outdoor treatment. In the rear, over the mess rooms, are four rooms for hospital stewards, a dining room, and utility rooms. The surgical department is located on the third floor of this central part. The main ward of 20 beds occupies the front, having a southeasterly exposure. A transverse corridor separates this ward from the X-ray and dark rooms, the laboratory, and the diet kitchen. The operating suite is in the newly constructed story over the rear annex and consists of two operating rooms with independent preparation rooms, a recovery and an anæsthetizing room, sterilizing, and instrument rooms. The operating rooms have a northerly exposure. They are finished in marble tiling on the floor and walls. The preparation rooms have the same, except that a marble wainscot extends up only 5 feet. The remaining rooms have a flooring of white vitreous tile.

The main wards, four in number, are on the first and second floors of the wings. Each has accommodations for 24 patients. At the outer end is a solarium. Adjacent to this, in the rear of a corridor leading from it to the ward, are the patients' washroom and toilets; in front, two quiet rooms with three beds in each. On either side of the entrance to the ward is a room for nurses or hospital corps men and dressings, and a room used as a quiet room in the lower ward of the north wing and as an officers' bedroom on the second floor; in the south wing as an examination room on the first and a bedroom on the second floor. In the rear of each ward, in the angle formed by the rear projection of the utility rooms and the ward, is a veranda directly accessible from the ward.

Each ward patient is allowed 79.5 square feet of floor space and 1,153 cubic feet of air space. The floors are finished in yellow Georgia pine.

The third floor of the south wing is principally occupied by the contagious-disease wards, which utilize about two-thirds of the entire space, being completely separated by a tight partition from a small 6-bed surgical ward at the inner end. The contagious part has three

small units of a total capacity of 23 beds, each unit having separate utility rooms. Access to this part is by an electric elevator and a stairway, both of which are reached through the south entrance to the basement, adjacent to which is a dormitory for the nurses or hospital corps men on duty and a mending and sorting room. A disinfecting plant is to be located at the outer end of the ward, with separate rooms for the infected and disinfected articles. A special food elevator is provided for these wards.

The allotted cubic air space (777 cubic feet) is less than desirable, provided all the beds are occupied. The erection of a separate building for infectious diseases is contemplated, the present arrangement being regarded as only temporary.

The corresponding floor in the north wing is intended for the members of the nurse corps and employees.

Only one diet kitchen, centrally located, is provided for each floor.

The heating is by a low-pressure steam system, with a vacuum pump to assist circulation.

The natural and artificial ventilation is exceptionally good, the latter being supplied by electric fans in the basement of the wings and rear annex, and when required the air is heated by passing over steam coils. The air supply is filtered and that furnished the operating department is passed through a water air washer.

Cleaning by the vacuum method is provided for all parts of the building.

No special system of nurses' calls other than the usual electric bells from the rooms is provided. The electric installation includes fire alarms, watchman's time detector, and a telephone exchange.

The water supply is passed through a mechanical filter capable of supplying 3,600 gallons per diem. A distilling plant having a capacity of 1,000 gallons per diem supplies water for drinking and culinary purposes.

The total capacity of the hospital, not including the quiet rooms, is 159 beds for enlisted patients and 6 for sick officers.

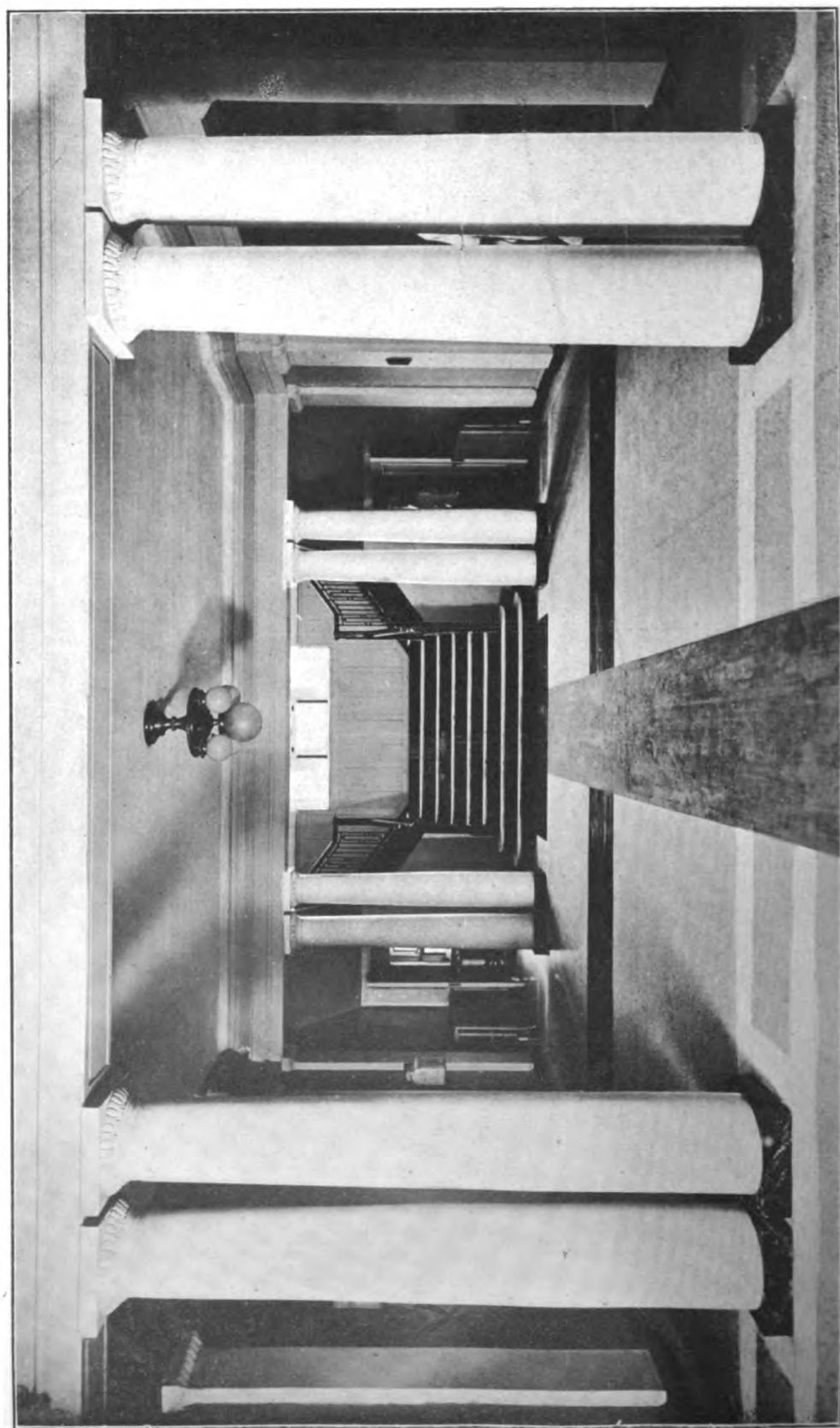
The cost of reconstruction has been about \$1,000 per bed. While in some respects not equal to the new naval hospitals now building, this hospital is well up to modern standards.

Separate quarters are provided for the medical officer in command, and a suite of rooms in the hospital is assigned to a junior medical officer.

NAVAL HOSPITAL, NORFOLK, VA.

This hospital, erected in 1832 at a cost of \$270,000, remained practically unchanged until 1907. Some attempts were made to modernize it by interior improvements, and in 1896 a fairly good operating room was built in the end of the upper floor of the south wing.





ENTRANCE LOBBY, UNITED STATES NAVAL HOSPITAL, NORFOLK, VA.

While the massive granite walls showed no signs of age, deterioration elsewhere rendered the cost of maintenance excessive. The importance of this hospital has been increased by the presence of 1,000 to 1,800 apprentice seamen under training at the navy yard and by the periodical visits of the Atlantic Fleet en route to and from the southern drill grounds.

This hospital is exceeded by none of the naval hospitals in the attractiveness of its immediate environment. Situated near the center of a reservation containing 86 acres, occupying a point around which sweeps the Elizabeth River, it is ideally located.

In 1907, under a congressional appropriation of \$200,000 (Naval Acts of June 29, 1906, and May 13, 1908), a complete renovation of the hospital was commenced and later the erection of two new wings for wards was started. Fortunately the block plan of the hospital readily lent itself to extension, and the work was completed in 1910.

With the exception of the outer walls, the hospital has been practically rebuilt, structural steel replacing the massive stone supporting columns and buttresses and wooden rafters. The floors are re-enforced concrete and the partitions hollow tile or brick. The toilet annex which formerly closed in the southwest side of the block has been removed, allowing free access to the interior court on that side.

The two new wings, three stories in height, built of brick, stucco-covered to resemble the older construction, project laterally from the front portion at the junction with the rear wings. The hospital now has four wings, each containing three wards. The central or front portion of the former block contains the administrative offices, sick officers' rooms, and, on the recently added fourth floor, the operative department.

In the basement, which extends beneath all parts of the building, centrally located, is the main kitchen, which has a floor area of 1,760 square feet. It is well equipped with steam cereal cookers and stock kettles, vegetable cookers, tea and coffee urns, and steam serving tables. The floor is of asbestolith. Adjacent to it are the cold-storage rooms, pantries, provision storerooms, serving rooms with dumb waiters to the diet kitchens on the floors above, and the convalescents' and attendants' mess rooms. In the rear wings are the cells for the insane and for prisoners, the bag and hammock, linen, and medical storerooms. Under the north wing is a mortuary and autopsy room and the hydrotherapeutic suite. Beneath the south wing there is a large recreation room.

The basement rooms, as a rule, have a concrete floor. The patients' dining room has a tiled floor and walls. The storerooms are provided with metal lockers and shelves.

The main entrance remains as formerly with its 10 massive Doric pillars and broad granite steps leading from the ground level to the

first floor. The exterior door opens upon the entrance vestibule, on one side of which is the cloak room, on the other the telephone exchange and orderly station. Beyond this is the lobby, in the rear of which is the main stairway, and laterally the corridors to the wings. On the left of the stairway is the waiting room; to the right a general toilet. Along the front of this part are the offices for the medical officer commanding, the executive surgeon, record clerks, officer of the day, a reception room for visitors, a suite of rooms for a junior medical officer, the laboratory, and the dispensary. On the second floor are rooms for seven invalid commissioned officers, with a bath and toilet between each two rooms, a dining room, pantry, and a recreation room.

The third floor has four bedrooms, a pantry, and dining room for sick warrant officers, and four rooms available for hospital stewards. A 9-bed ward on this floor, which was designated for warrant officers, is now used as an X-ray room.

The operative department occupies the recently constructed portion on the fourth floor beneath the dome. It is accessible by a stairway and an elevator located on each side in the angle formed by the junction of the rear wing and the front portion. The entrance for ambulance cases is directly from the court in the rear to the elevators. This department comprises an operating room $25\frac{1}{2}$ by $19\frac{1}{2}$ feet, a surgeons' dressing and preparation room, a nurses' preparation room, and instrument and dressing room, sterilizing, anaesthetizing, and recovery rooms. The operating room has both overhead and lateral illumination. The entire suite of rooms has a floor of white vitrified tiles $4\frac{1}{2}$ inches square and a 6-foot wainscot of the same material. The walls and ceilings are of Keene's cement, covered with white enamel.

The wards, 12 in number, 3 in each wing, are practically similar. The utility rooms, consisting of a diet kitchen, toilets, and a nurses' or dressing room, occupy the near end. At the further end, in a lateral extension of the ward on either side, is a 1-bed quiet room. The new wards are 82 by 26 feet, the rear wards 112 by 23 feet. The normal capacity is 18 beds in the new and 26 in the rear wards, allowing about 1,500 and 1,300 cubic feet per patient, respectively, and an average of 100 square feet of floor space per bed.

No solarium are provided, the patients from all wards having access to the verandas on each side of the rear wings, which, in the temperate climate of Norfolk, can be used with comfort during much of the year.

The floors in the wards, corridors, living rooms, and dining rooms are of yellow Georgia pine. In the diet kitchens the floor is asbestolith; in the toilets terrazzo. The floor and wainscot in the entrance vestibule are marble. The lobby has a terrazzo floor.

The hospital is heated by a forced hot-water system, with both direct and direct-indirect radiators; also the air of the plenum ventilating system is heated by passing over hot-water stacks. Both of these methods are under automatic thermostatic control.

Artificial ventilation is provided by plenum and exhaust systems. The supply fans are in the basement. The air is passed through gauze filters, heated and humidified as required, and conveyed to the living spaces, into which it passes through registers near the ceiling and the floor. The exhaust fans remove the air from collecting chambers in the attics. The diet kitchens are provided with electric ranges, steam plate and food warmers, refrigerators, and dressers. All furniture in the linen lockers, dispensary, dressing rooms, and wards is of metal.

The contagious-disease building is located about 600 yards to the westward of the main hospital. It is a more or less temporary structure, built originally for use during the reconstruction of the hospital. It has recently been extended and now has a capacity for 41 patients.

The power plant is situated 200 yards in the rear of the hospital. It supplies steam, electric light, and power to the entire institution. Under the same roof are a laundry and a disinfecting plant.

The stable, store sheds, and guardhouse are in a poor state of repair.

In 1906-7 two sets of officers' quarters were erected under a congressional appropriation of \$20,000. (Naval act of Apr. 27, 1904.) These houses are located to the westward of the medical director's residence.

This hospital has the rather unique advantage of a landing with a sufficient depth of water to permit the approach of a tug alongside, thus allowing the direct transfer of patients from the ships. The transfer of patients from the navy yard, about 3 miles distant, is effected by an automobile ambulance.

The water supply is that of the city mains. A reserve supply is maintained in a 120,000-gallon tank. For drinking and surgical purposes distilled water is supplied through special pipes to all parts of the hospital.

The total cost of reconstruction and the erection of the new wings aggregates \$437,684. The total normal capacity is 300 beds, giving an approximate cost per bed of \$1,454, including private rooms for officers. In addition to the above there are 40 beds in the isolation hospital.

At the present time, in the absence of special quarters for the nurses, Hospital Corps men, and civil employees, the two upper wards of the rear wings are assigned to this use.

NAVAL HOSPITAL, WASHINGTON, D. C.

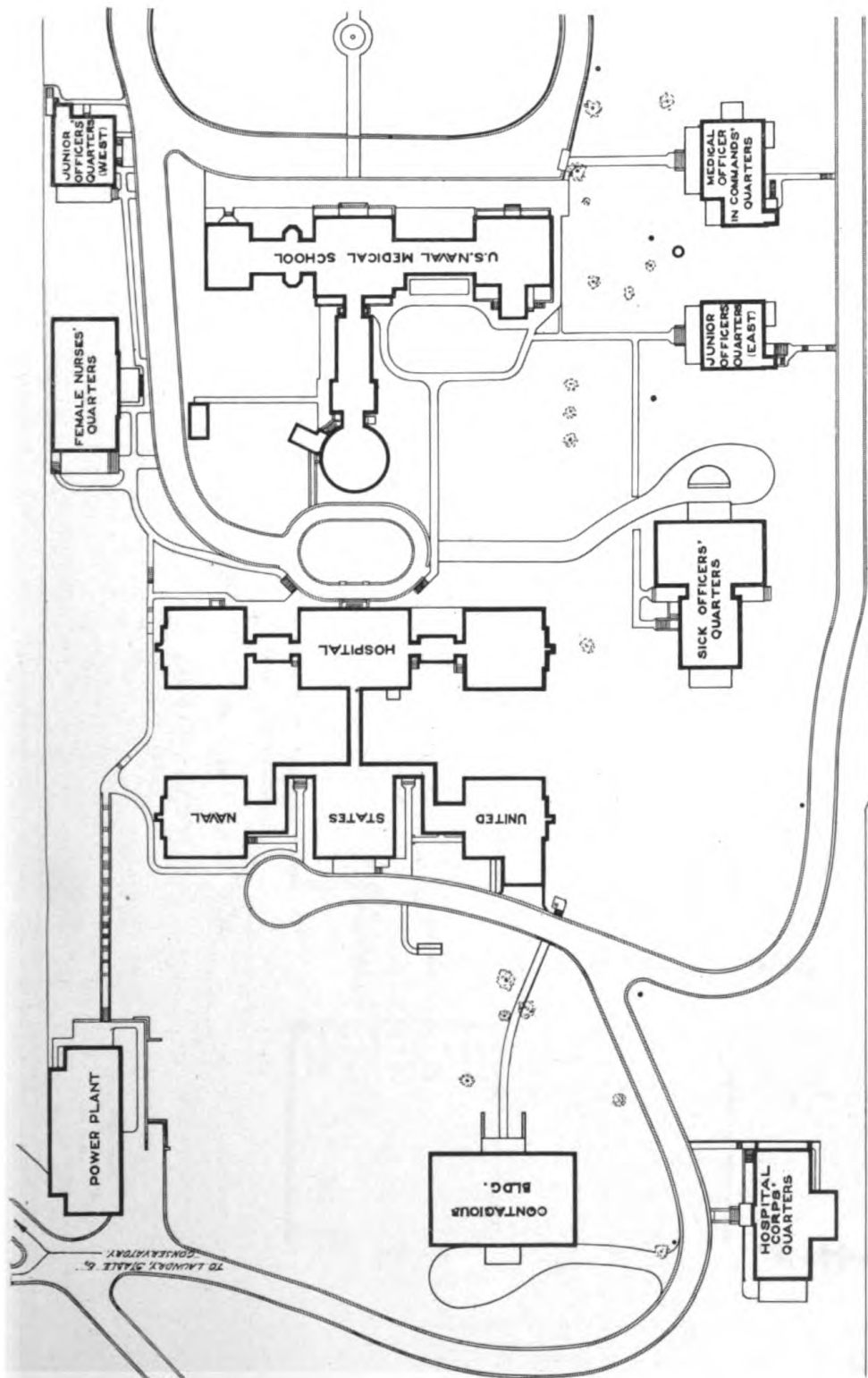
This hospital, formerly designated as the Naval Medical School Hospital, was designed with the twofold object of replacing the antiquated naval hospital in Washington by a model modern structure and, as its original title indicates, to provide clinical facilities for the recently appointed medical officers under instruction at the Naval Medical School. It is located near the Potomac River, at the foot of Twenty-fourth Street, in the rear of the Naval Medical School.

The original plans purposed the erection of the main hospital, consisting of a three-story administration building, a subsistence and operating building, four small one-story pavilion wards, and a power plant, laundry, and stable. However, with the completion of the above, the need for more sick officers' rooms, for special provisions for contagious diseases, and for purposes of instructing the nurses and the Hospital Corps men, as well as for quarters for the medical staff, became apparent.

In 1903 Congress appropriated \$125,000 (naval act of Mar. 3, 1905) for the construction of the main hospital, power plant, and laundry, and the work was started in 1904, the plans being designed by Ernest Flagg, who was also the architect of the Annapolis Hospital. The above sum was found to be insufficient to complete the hospital, and in 1905 the sum of \$20,000 was appropriated (deficiency act of Mar. 3, 1905) to build the southeast and southwest wards. The hospital was placed in service October 1, 1906, in an incomplete condition.

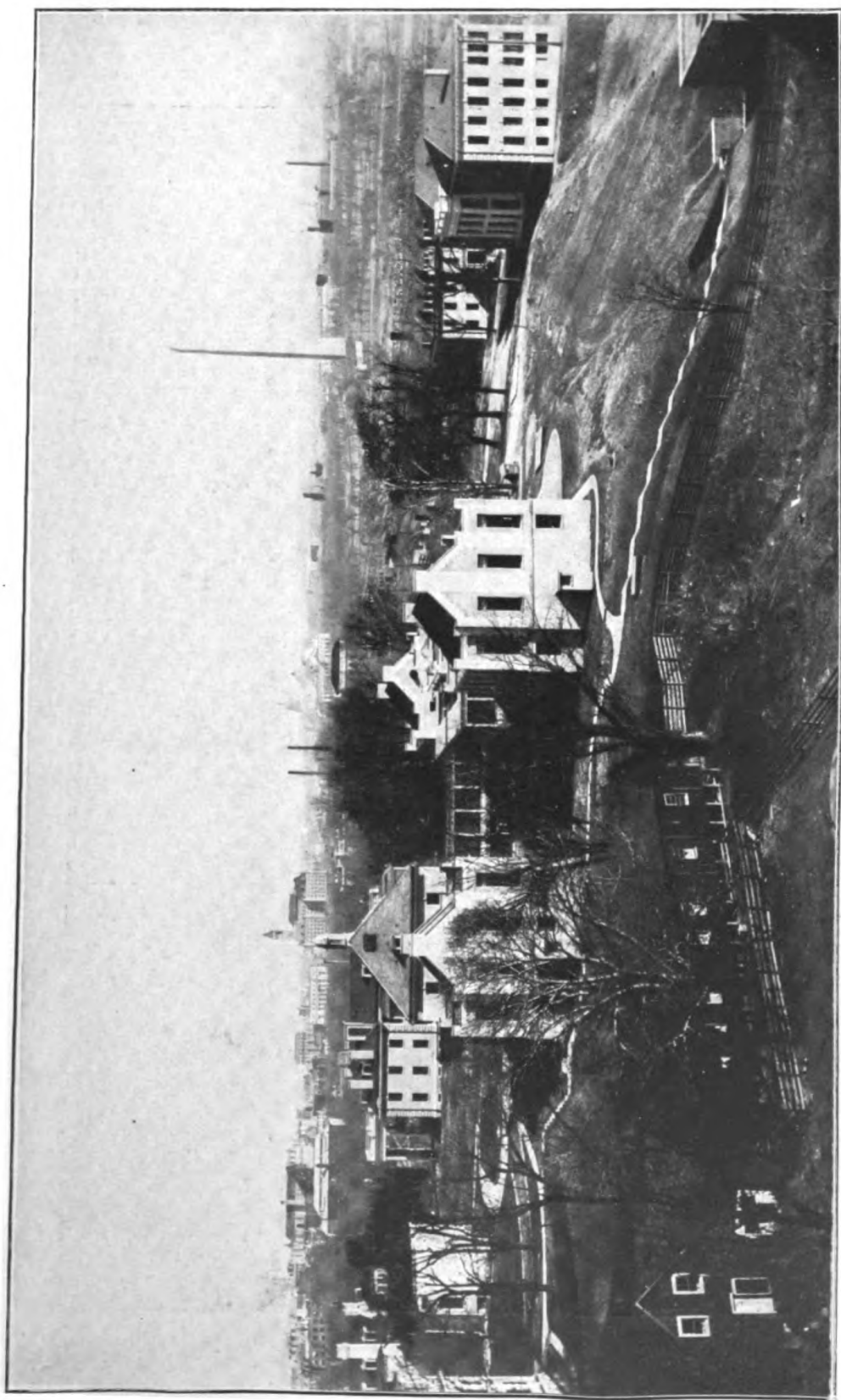
The sick officers' quarters, the contagious-disease hospital, the quarters for the nurses, the quarters for the Hospital Corps men, and three houses for medical officers have been constructed under plans prepared by and under the supervision of the Bureau of Yards and Docks. The cost of these seven buildings, aggregating \$333,388, includes outside work, such as grading, road making, conduits, and laying walks. This has been defrayed from the naval hospital fund. The total cost of this institution has been about \$543,388, and considerable work still remains to complete it. The cost per bed of the main hospital was \$2,935, and of the sick officers' quarters \$1,792.

The main hospital is near the center of the grounds facing the north and the medical school. The houses for the medical officer in command and for one junior medical officer, the sick officers' quarters, and those for the Hospital Corps men occupy the eastern boundary of the reservation from north to south. At the northwest part is a junior medical officer's house and the nurses' home. To the rear of the main hospital is the contagious-disease hospital, and in the southwest corner are the power plant, steam laundry, stable, and the

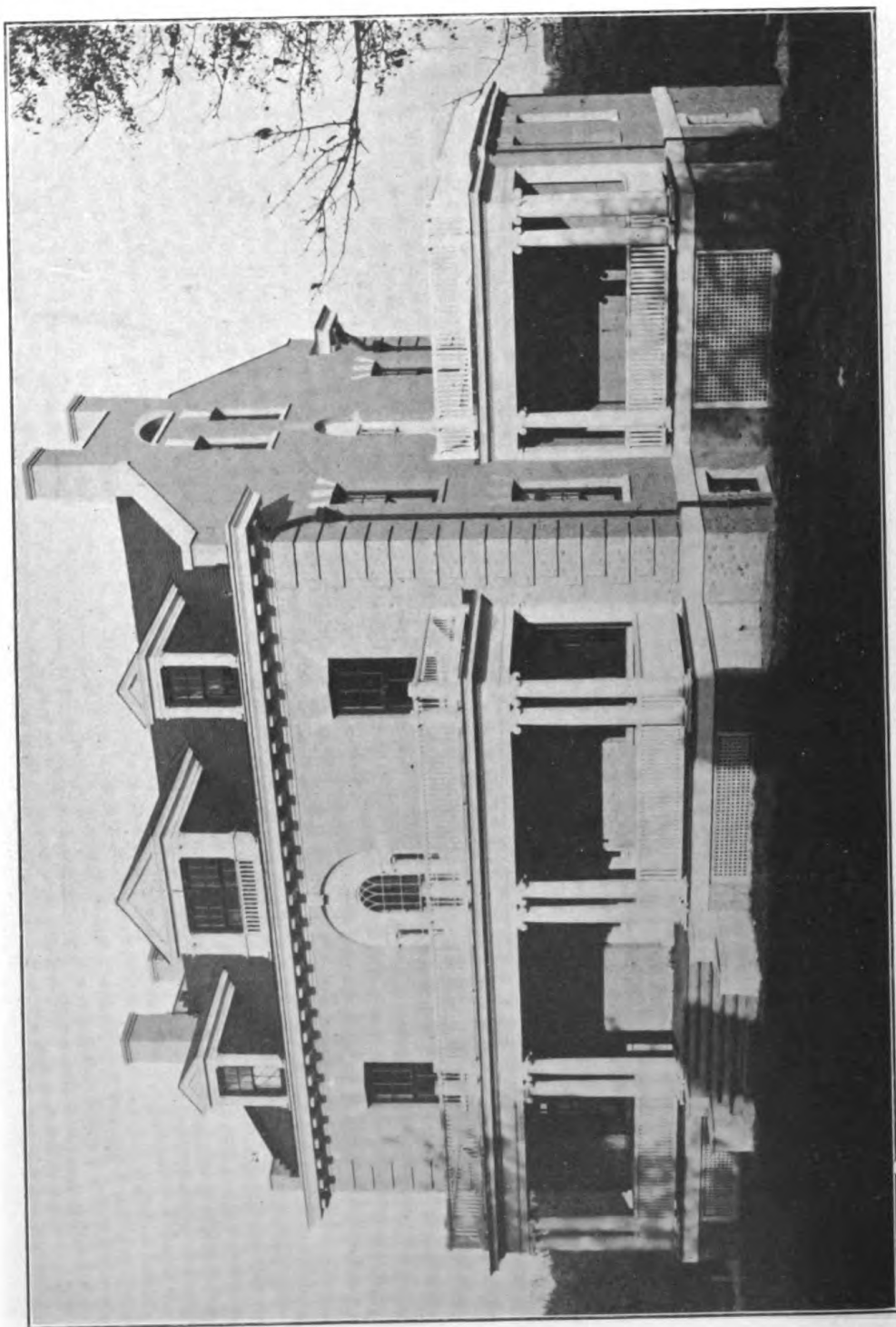


UNITED STATES NAVAL HOSPITAL AND MEDICAL SCHOOL RESERVATION, WASHINGTON, D. C.

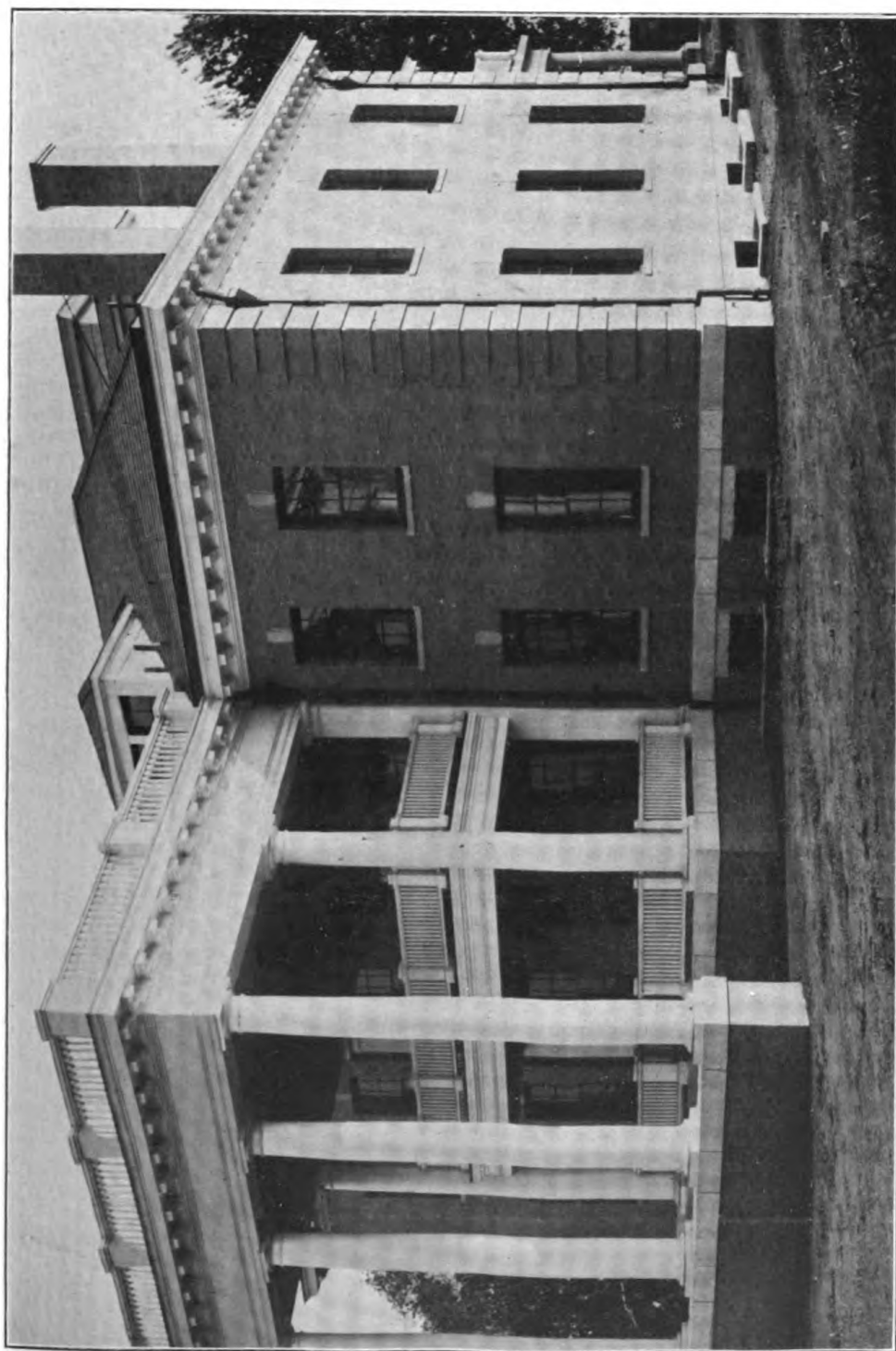
The main hospital building faces north.



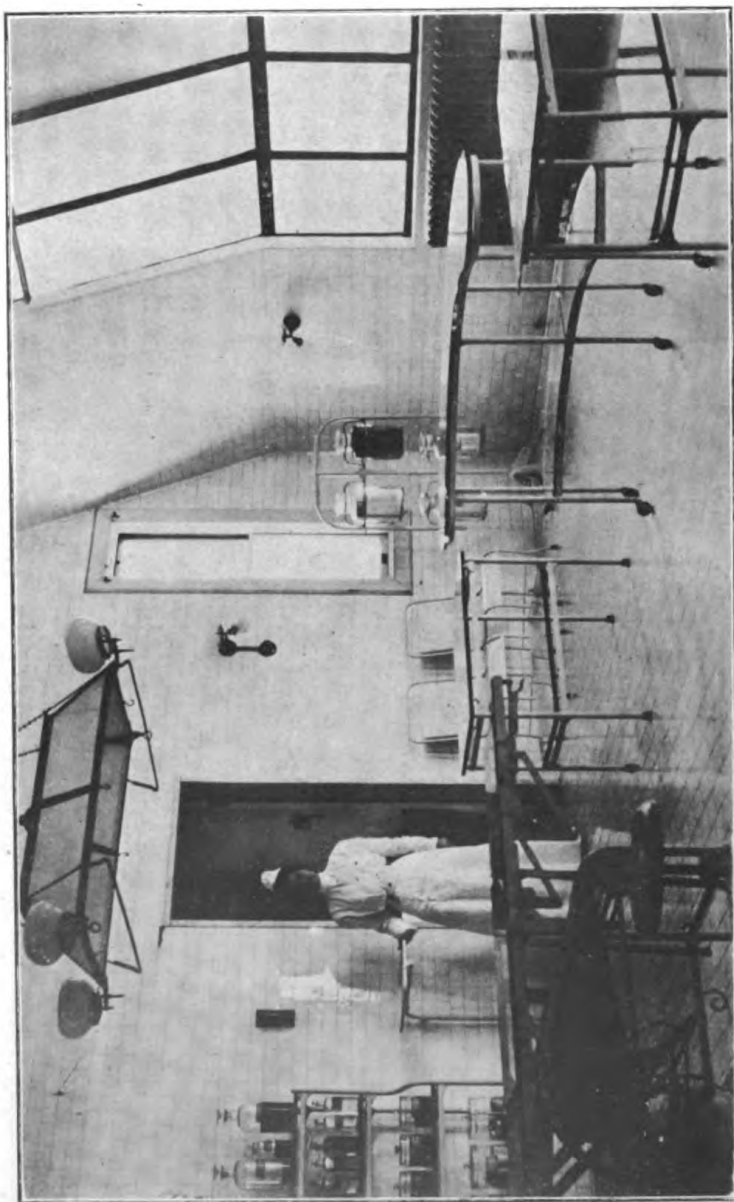
Portion of hospital reservation, viewed from the west.
UNITED STATES NAVAL HOSPITAL, WASHINGTON, D. C.



Commanding officer's quarters.
UNITED STATES NAVAL HOSPITAL, WASHINGTON, D. C.



Sick officers' quarters.
UNITED STATES NAVAL HOSPITAL, WASHINGTON, D. C.



Operating room.
UNITED STATES NAVAL HOSPITAL, WASHINGTON, D. C.

greenhouse. The buildings are all similar in construction and are practically fireproof. The building material is light-buff vitreous brick, structural steel frames, concrete floors and ceiling, and slate roofs. The interior finish is plain, and in the newer construction all angles are coved and the doors flush panel. The floors are yellow Georgia pine, laid on sleepers imbedded in cinder concrete. In the utility rooms and in the morgue and autopsy rooms the floors and, in the latter two rooms also, the walls are tiled.

The entire institution is supplied with electric light, power, and heat from a central plant. The buildings have independent hot-water or steam heating systems, the radiators having automatic thermostats. The main hospital and the contagious-disease building have independent plenum and exhaust systems of ventilation. Provision is made for cleaning the air supply either by gauze filters, as in the main building, or by a water air washer, as in the contagious-disease building. The heating of the incoming air is accomplished, when desired, by passing it over heating stacks, the temperature being automatically controlled by a damper regulating the admission of the cold air through a by-pass. The exhaust system is connected with motor fans in the attics over the various spaces. The service rooms are connected with this latter system only.

The main hospital consists of a central three-story administration building, an operating pavilion in the rear, and four one-story pavilion wards, one on either side of each of the above buildings, all having connecting solarium corridors. In the basement, beneath the administration building, the space is utilized for a large and well-appointed hydrotherapeutic room, an X-ray room, a dark room, the dispensary and medical storerooms. Beneath the operating pavilion are the main kitchen, pantry, refrigerating room, and mess rooms for patients and employees.

The basement under each ward has a machinery room containing the blower and heater, the serving and soiled linen rooms for the corresponding ward unit. Also in the basement of the northwest ward is a suite of rooms for the out-patient clinics, in that of the southwest ward mess rooms for the Hospital Corps, in that of the southeast ward a garage, a disinfector, and the mortuary and autopsy rooms. The basements beneath the various corridors are utilized for cells and the storage of bags and hammocks, and for other purposes.

A large porte-cochère protects the main entrance to the hospital on the north side of the first floor of the central building, its roof affording space for a sun porch for the patients on the second floor. From the entrance vestibule a hall leads to the rear and laterally to the corridors to the wards. On this floor are the offices of the medical officer in command, the executive surgeon, officer of the day, and

the record clerks, two rooms and a toilet for a medical officer, and a telephone and orderly station. The second floor has 6 rooms for sick officers, a dining room, and a pantry. On the third floor are rooms intended for the Hospital Corps. The operating department in the rear has anæsthetizing and recovery rooms, a dressing and instrument room, and preparation rooms. The operating room faces the south, and in consequence is extremely hot in summer and the light is dazzling. The floors and wainscot are tiled, the walls finished in white enamel and the ceiling of pressed steel.

The four wards are similar in size (50 feet 8 inches by 50 feet 8 inches by 15 feet), each having accommodations for 18 patients, including 2 in the quiet room. The estimated air space is 1,613 cubic feet per patient, the floor space being 107.5 square feet per bed. The wards are well lighted, having 26.25 square feet of glass per bed. The corridors are utilized for solaria, being widened near each ward. The utility rooms are located on each side of the entrance.

The sick officers' quarters have a basement and three stories. The entrance is on the north side, over which, on a level with the third floor, is a large portico supported by six pillars. Beneath this, on a level with the second floor, is a smaller portico immediately over the entrance. These porticoes serve as a veranda for the corresponding floors. The first floor has an office, a reception room, library, a nurses' and dressing and medicine room, diet kitchen, and 5 rooms for patients. The second and third floors have 17 bedrooms and the usual service rooms. As a rule there is a bathroom between each 2 rooms. All floors have elevator service. On the second floor 2 rooms have been utilized for an operating room and a dressing room.

The contagious-disease hospital is planned to accommodate four types of this class of diseases. The entrance for patients is on the south side of the basement into the receiving room, thence by elevator to all floors. The remaining space in the basement contains the disinfecting plant, main kitchen, serving rooms, a dormitory and mess rooms for the attendants, a mortuary, storerooms, and a machinery room. The arrangement of the two floors above is similar, each being bisected by a wide corridor running north and south open at each end permitting free circulation of air. The elevator shaft, entirely inclosed, runs through the center of these corridors. On either side of the south end of this corridor on each floor is a 6-bed ward and, in connection with each, a diet kitchen with an independent dumb waiter to the basement and serving room, a toilet and lavatory, and two quiet rooms. In addition to the four isolation units there are two rooms for nurses and an office and suite of rooms for a resident medical officer. The diet kitchens are to be provided with steam tables and electric ranges. The toilets are tiled and the partitions gray Tennessee mar-

ble. Steam sterilizers are provided for the disinfection of utensils. The entrance to each ward from the open corridor is through a vestibule with a door at each end, this with the exhaust ventilation should prevent infection from one unit to another. The capacity of this building is 30 beds.

The nurses' quarters have a kitchen, storerooms, and a bedroom for the attendants in the basement; on the first floor are the quarters and office for the head nurse, a reception room, a lecture room, and a dining room; and on the second and third floors are accommodations for 18 nurses.

The building for the hospital apprentices is two and one-half stories in height, in addition to a basement. It has accommodations for 57 men, an office, a lecture room, a recreation room, and mess rooms.

The power plant consists of three 90-horsepower boilers supplying power to all the hospital buildings, the water, steam, and electric mains being transmitted through conduits.

The total normal capacity of the hospital is as follows: Main hospital, 78 beds; sick officers' quarters, 22 beds; contagious-disease hospital, 30 beds; total, 132 beds. This is capable of expansion to 175 beds, or by utilizing the hospital corps quarters to 240 beds.

NAVAL HOSPITAL, ANNAPOLIS, MD.

The first hospital at the Naval Academy was a brick structure to the northward of the station, built by Admiral Porter soon after the termination of the Civil War. The design was typically naval, the outline of the building resembling an anchor. But little use was made of it, the locality being insalubrious, so that it was practically abandoned in 1873, and the use of a portion of the cadet quarters as a hospital continued.

The reconstruction of the Naval Academy in 1902-1908 necessitated the demolition of the cadet quarters. The Bureau of Medicine and Surgery, in 1902, requested the allotment of \$200,000 from the appropriation for new construction at the Naval Academy for the erection of a modern hospital in keeping with the architectural features of the other buildings. The sum of only \$100,000 was allowed, which required a modification of the original plans. These plans were designed by an architect employed under the superintendent of the academy and submitted for the approval of the Bureau of Medicine and Surgery. The complete plan of the institution proposed the erection of a pavilion hospital on a broad H plan, the central administration building consisting of two and one-half stories and a basement, connected by corridors with 4 one-story wards situated at the ends of the vertical lines of the H, 4 isolation wards, a power house

and laundry, 3 sets of quarters for medical officers, quarters for members of the Nurse Corps, and a stable.

The hospital, including the isolation wards, which are arranged in pairs on either side, has a frontage of about 418 feet facing the northeast and the Severn River.

The reservation is about a mile from the Naval Academy and includes approximately 19 acres of what was formerly known as the Government farm. The elevation is from 40 to 60 feet above the sea level, from which height the land slopes gradually to the river.

Owing to the insufficient initial appropriation, only the administration building and three wards and the laundry and power house were contracted for in 1905. Subsequently a further sum of \$100,000 was allowed from the Naval Academy appropriation, and in 1908 \$85,000 was appropriated by Congress (naval act of May 13, 1908) for the completion of the remaining buildings, namely, two isolation wards, which were finished in 1910 at a cost of \$81,000.

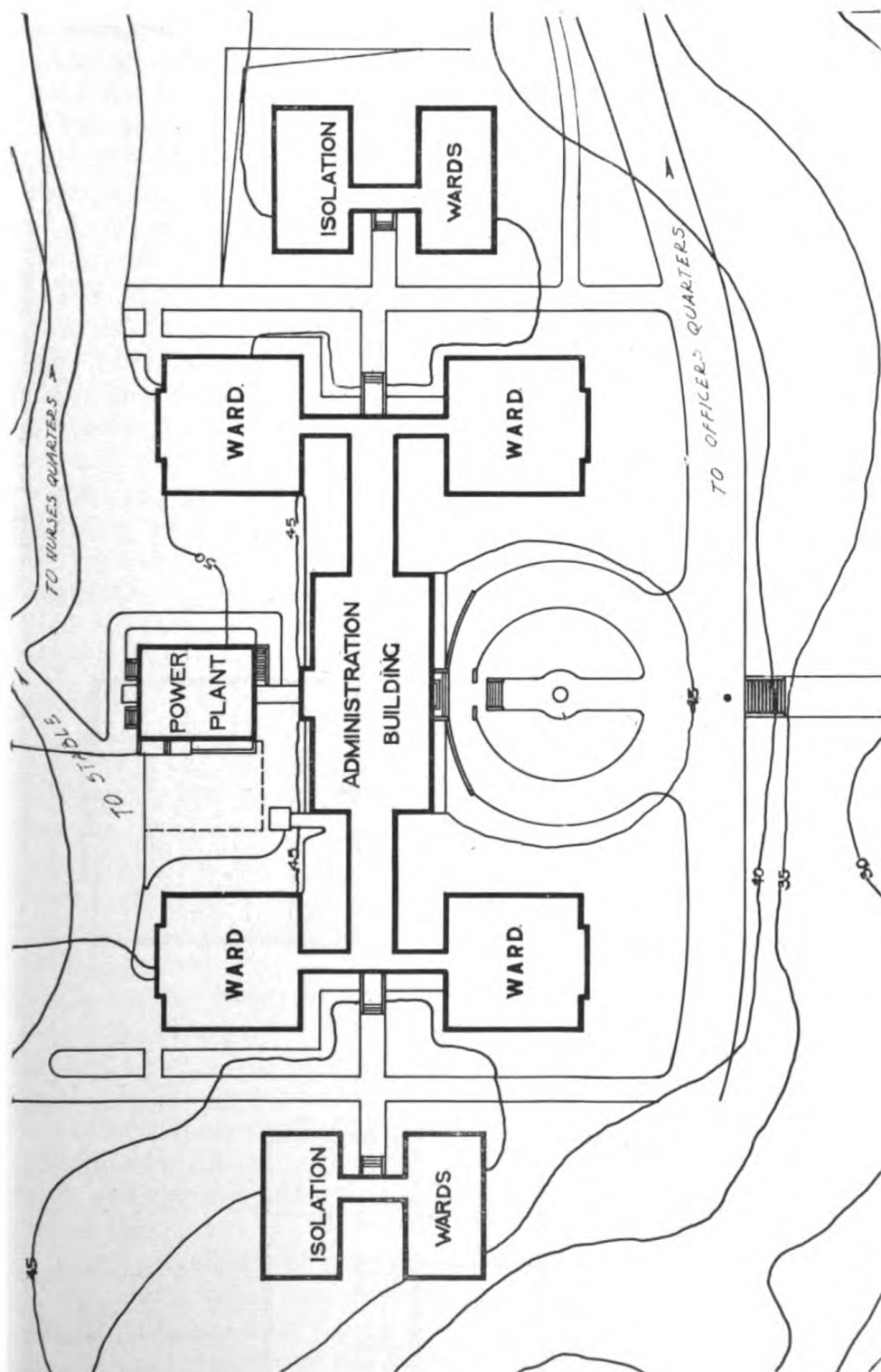
The hospital was placed in service in 1908, but all the buildings were not completed until 1909, when they were provisionally accepted.

In construction the buildings are fireproof. The foundations are concrete and granite, the exterior walls glazed granite-colored bricks with granite facings.

The floors are of reenforced concrete and the roof of the same material covered with slate. The connecting corridors above the basement are of wooden construction and inclosed by windows which renders them useful as solaria. The floors in the wards and in the rooms in general are yellow Georgia pine laid on cinder concrete. The kitchen, serving rooms, mortuary and autopsy rooms, the toilets and baths, and the hydrotherapy room have a circular ceramic tile flooring. The floor and walls of the operating room and the mortuary and autopsy rooms are finished with "novus" white opaque glass tiles $4\frac{1}{2}$ inches square. The room for soiled linen is similarly finished. The basement beneath the administration building contains the main kitchen, serving room, mess rooms for Hospital Corps men and enlisted patients. Beneath the east corridor is the cold-storage plant, and in that of the west corridor are the cells for prisoners and the bag and hammock storeroom.

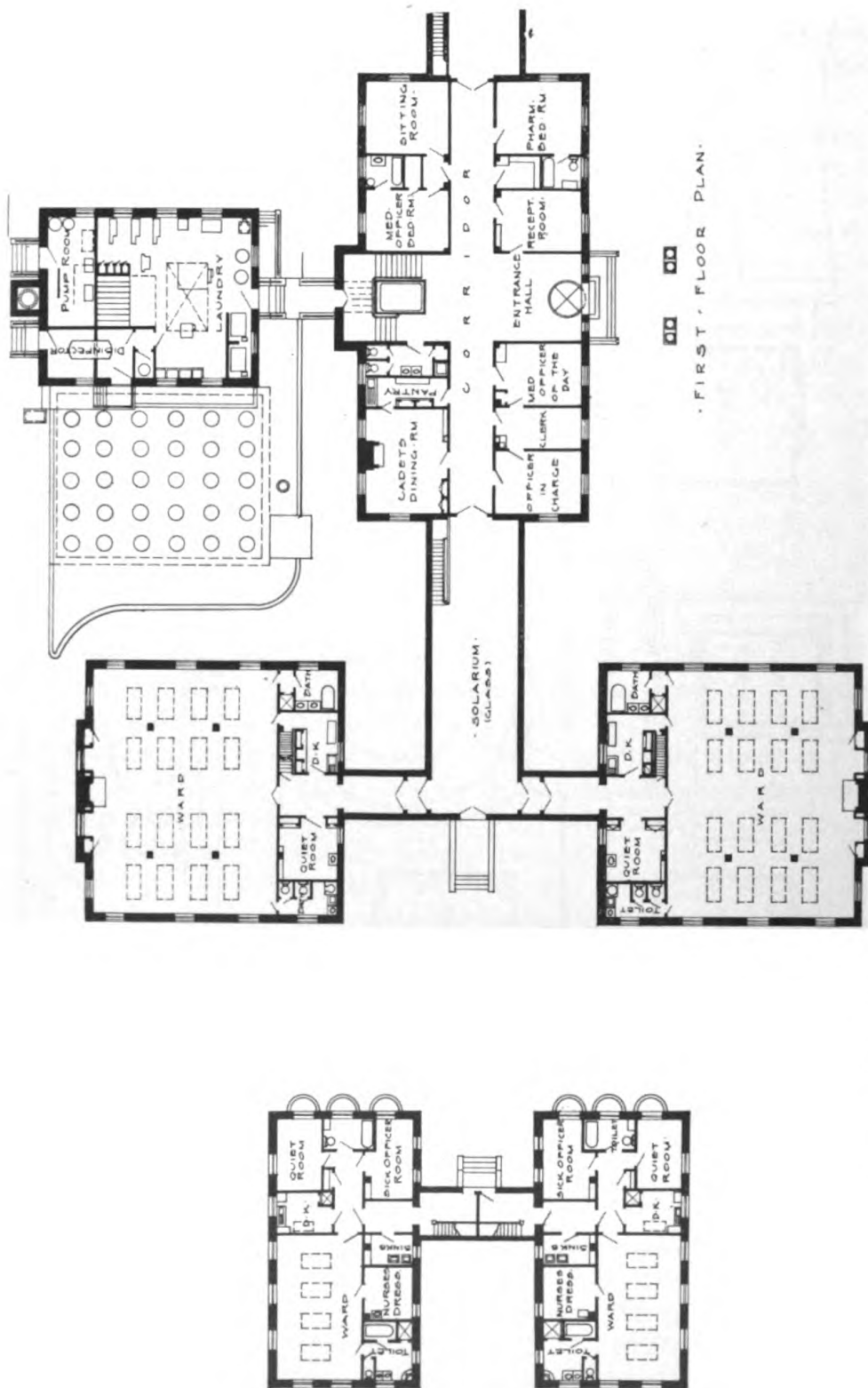
The ward basements are occupied by a serving room with a dumb waiter, the mortuary and autopsy room, recreation rooms, a dark room, and the disinfecting plant.

The main entrance to the hospital, protected by a porte-cochère, is on the north side of the administration building, giving access to the first floor on which are the executive offices, a reception room, midshipmen's dining room and pantry, and two suites of rooms with baths.



UNITED STATES NAVAL HOSPITAL RESERVATION, ANNAPOLIS, MD.

The hospital faces to the northeast, overlooking the Severn River. Three buildings for officers' quarters lie 125 feet northwest of isolation wards in line with the hospital. Nurses' quarters and the stable are, respectively, 150 feet west and 250 feet southwest of the hospital.



PORTION OF FIRST-FLOOR PLAN, UNITED STATES NAVAL HOSPITAL, ANNAPOLIS, MD.
 Identical wards to those shown extend to the northwest from the administration building. (See general layout of this reservation.)

The southeast end of the second floor of this building has 4 rooms, a dining room, pantry, and toilet for sick officers. The opposite end is occupied by the X-ray room, laboratory, operating, etherizing, dressing, and preparation rooms. On the third floor are accommodations for 11 Hospital Corps men.

The 4 wards are similar in all essential particulars. Each has a normal capacity of 16 beds in the main ward and 2 in a quiet room, allowing 1,613 cubic feet of air space and 107.5 square feet of floor per bed. Adjoining the entrance to the ward are the service rooms and a quiet room.

The wards on each side are connected by a corridor, which in turn is connected with the administration building. The 4 isolation wards are situated 2 on each side of the main hospital and about 40 feet distant from it. They are about 30 feet apart, being connected by a covered way. The northwest wards have a normal capacity of 8 beds, including 2 in a quiet room, and in each there is a diet kitchen and a nurse's and dressing room. The southeast isolation wards have but 4 beds, with 2 quiet rooms of 1 bed each.

The wards are heated by two systems, indirectly, by the plenum ventilation system and by direct radiation. The basement has direct radiation, and all other rooms have direct-indirect radiators. Ventilation, other than natural, for the wards is provided by a plenum and an exhaust system for each ward, the motor blowers for the former being located in the basement, for the latter in the attic of each ward. The supply blower is calculated to provide 1,700 cubic feet of air per minute, heated to 70°, when required, by passing over heating stacks. The heating of the air supply and also the direct and indirect radiators are under automatic thermostatic control. The plenum system discharges into the wards by registers in the central columns, while the exhaust is taken from the ceiling registers.

The power house is directly in the rear of the administration building. The power plant, consisting of two 90-horsepower boilers, is in the basement, the steam laundry occupying the floor above.

The buildings are lighted by electricity only. Complete systems of intercommunicating telephones, fire alarms, call bells, and a watchman's time detector are installed.

A salt-water system is provided for flushing purposes and fire protection.

Three sets of officers' quarters, a home for the members of the Nurse Corps, and a stable have recently (1910) been completed at a cost of \$96,000, allowed from the naval hospital fund.

The total capacity of the institution is 100 midshipmen or enlisted patients and 4 officers. The emergency capacity is 130 beds.

This hospital is well adapted to the needs of this station; it is bright and cheery and is only open to the objection which obtains in all hospitals with small detached wards with connecting corridors, i. e., a large initial cost per bed and increased difficulty in administration.

The cost of the hospital buildings has been \$265,000, which makes the cost per bed \$2,548.

NAVAL HOSPITAL, GREAT LAKES, ILLINOIS.

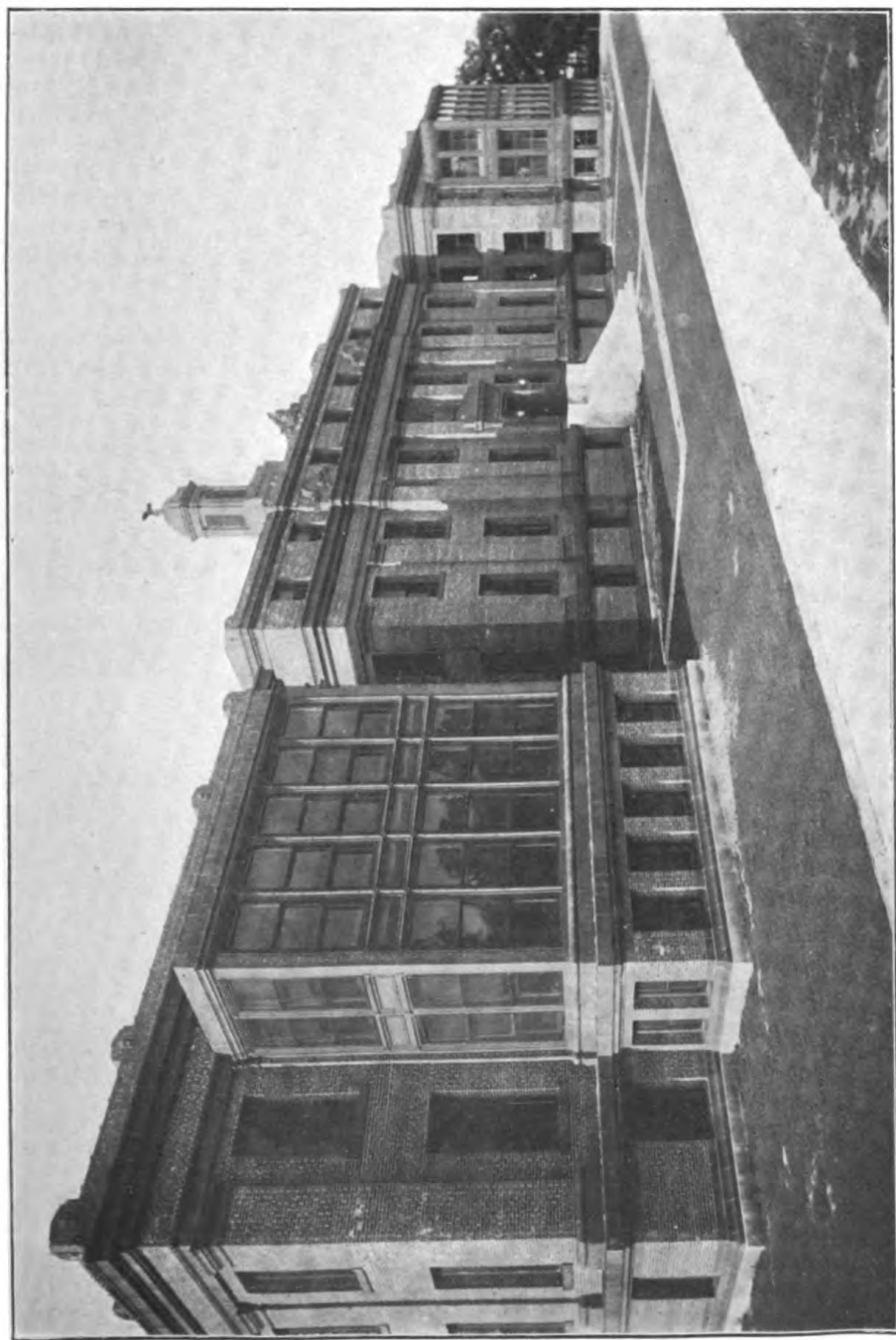
The naval training station, Great Lakes, is located on the shore of Lake Michigan, about a mile from North Chicago, Ill., and about 32 miles from the city of Chicago. It is situated on a bluff at an elevation of about 50 feet above the level of the lake. This training station has the advantage, so rarely afforded, of an ample initial appropriation permitting the simultaneous erection of all necessary buildings on a comprehensive and well-considered plan whereby provision is made, not only for the housing of 1,000 apprentice seamen, but also for a proper water supply, a system of sewage disposal, detention barracks to prevent the spread of infectious and contagious diseases by recruits, and accommodations for the sick.

The climatic conditions of the station are such that combined with the age of the apprentice seamen, 17 to 20 years, a high rate of sickness is anticipated.

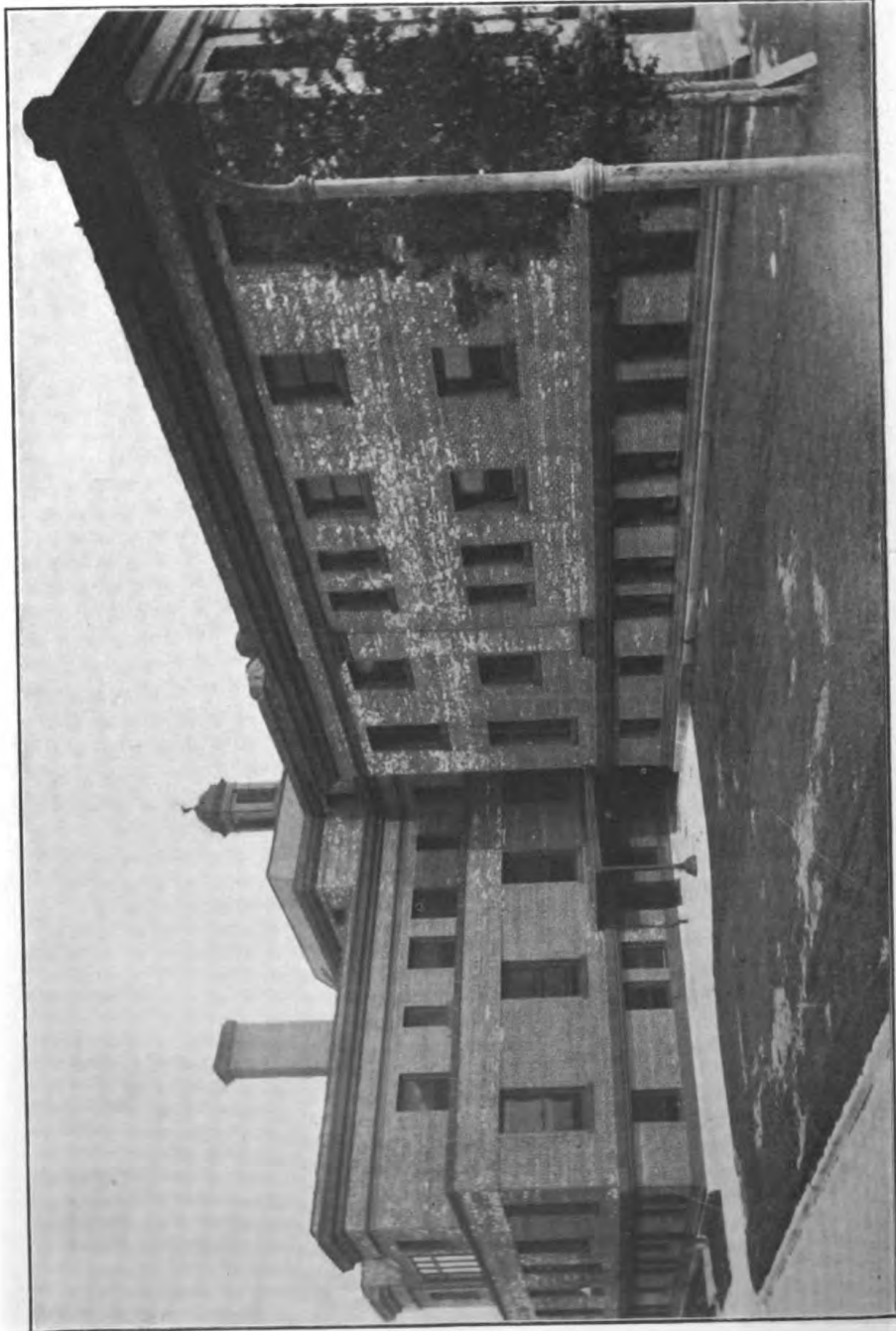
Appropriations by Congress amounting to \$250,000 (naval acts of May 13, 1908, and June 24, 1910) provided the construction of a hospital at this station. The hospital reservation is situated about a mile to the southward of the station, from which it is separated by a deep ravine. This ravine is crossed by a bridge which also carries the water, power, and sewer mains, the first two for the hospital, the latter, after receiving the sewage from the hospital, passes to the filtration and reduction plant on the lake shore below the hospital.

The hospital buildings, with the exception of the officers' quarters, which face the west, have a direct southern exposure. Topographical and meteorological conditions here as at the station may have rendered this advisable, but it has the disadvantage of leaving the northern exposure of the buildings without direct sunlight during the winter months. This has evidently been considered in the plans for the hospital buildings by placing the wards and solaria on the south side, reserving the opposite exposure for the diet kitchens, toilets, and quiet rooms.

The plan of the main hospital is a modification of that of the "type" naval hospital, under which the hospitals at Portsmouth, N. H., and at other stations are being built.



Front of main hospital building.
UNITED STATES NAVAL HOSPITAL, GREAT LAKES, ILL.



UNITED STATES NAVAL HOSPITAL, GREAT LAKES, ILL.
Rear of main hospital building, viewed from the northwest.

The dissimilarity is principally in the abutment of the operating and subsistence building and the wards directly upon the administrative portion, eliminating the connecting corridors and solaria, in the arrangement of the ward accessories and sun rooms, and also in the more elaborate interior finishing.

The laundry and disinfecting plant are in a separate building in the rear of the west end of the hospital. No power plant is needed, as all power is supplied from the central plant at the station.

Three sets of officers' quarters are located on a north and south line east of the grounds in front of the main hospital.

A contagious-disease hospital is required for this station, but owing to a deficiency of funds the contemplated building has been abandoned, and temporary wooden structures for this purpose are being erected.

Quarters for members of the Nurse Corps are also proposed.

The plans for this institution were designed by Jarvis Hunt, of Chicago, Ill., under Rear Admiral Albert Ross, United States Navy, in charge of the construction on the station, subject to the approval of the Bureau of Medicine and Surgery. No expense has been spared to secure a hospital complete in every detail, absolutely fire-proof, aseptic in finish, and supplied with every well-recognized appliance for the care and comfort of the sick.

The contract for the main hospital building, laundry, and disinfecting plant and officers' quarters was awarded to the Noel Construction Co., of Chicago, Ill., in June, 1909, to be completed in October, 1910, but owing to various causes it was not ready for use until October, 1911. The four structures comprising the three officers' quarters and the laundry and disinfecting building cost \$79,000, this sum being allotted from the naval hospital fund.

The main building has a central administrative part, containing a basement and 3 stories, with a rear extension of 2 stories. On either side of this are the wings, consisting of a basement and 2 stories each. The framework is structural steel, the walls of dark-red vitrified brick on a stone and concrete foundation. The floors are reenforced concrete. The roofs are cement, covered by slate, or where flat, by composition.

The total frontage is 242 feet, the depth 94 feet. The wings are square, 53 feet 7 inches on each side.

In the basement of the central portion are located the autopsy and mortuary rooms, a soiled linen room with a chute from the floors above, a bag and hammock room, a darkroom for photographic purposes, a medical storeroom and dispensary, and in a sub-basement the water heating and sterilizing, refrigerating, and vacuum cleaning plants. In the rear extension is the main kitchen, storerooms, cold

storage, bakery, pantry, servants' mess room and toilet, and a garbage incinerator. Under each wing is a large recreation room, available as dormitories for hospital apprentices in the absence of other accommodations for them, a fan room and a serving room with electric dumb-waiters to the wards above. In addition, in the west wing, there is a large hydrotherapy room and a linen mending room. In the east wing is the laboratory and cells for the insane and for prisoners.

Two entrances for ambulance cases, one on either side, are in the rear of the administrative part at the junction with the wings. These have canopies for protection from the weather and from them easy access is had to the elevator.

The main entrance is on the first floor of the administration building. Double doors give access to an entrance vestibule from which steps ascend to the lobby from which corridors extend laterally to the wards and in the rear to the general mess room. To the front of the transverse corridor, from right to left, are the offices of the medical officer commanding, the record clerks and officer of the day, a reception room, the executive surgeon's office, and a nurses' parlor.

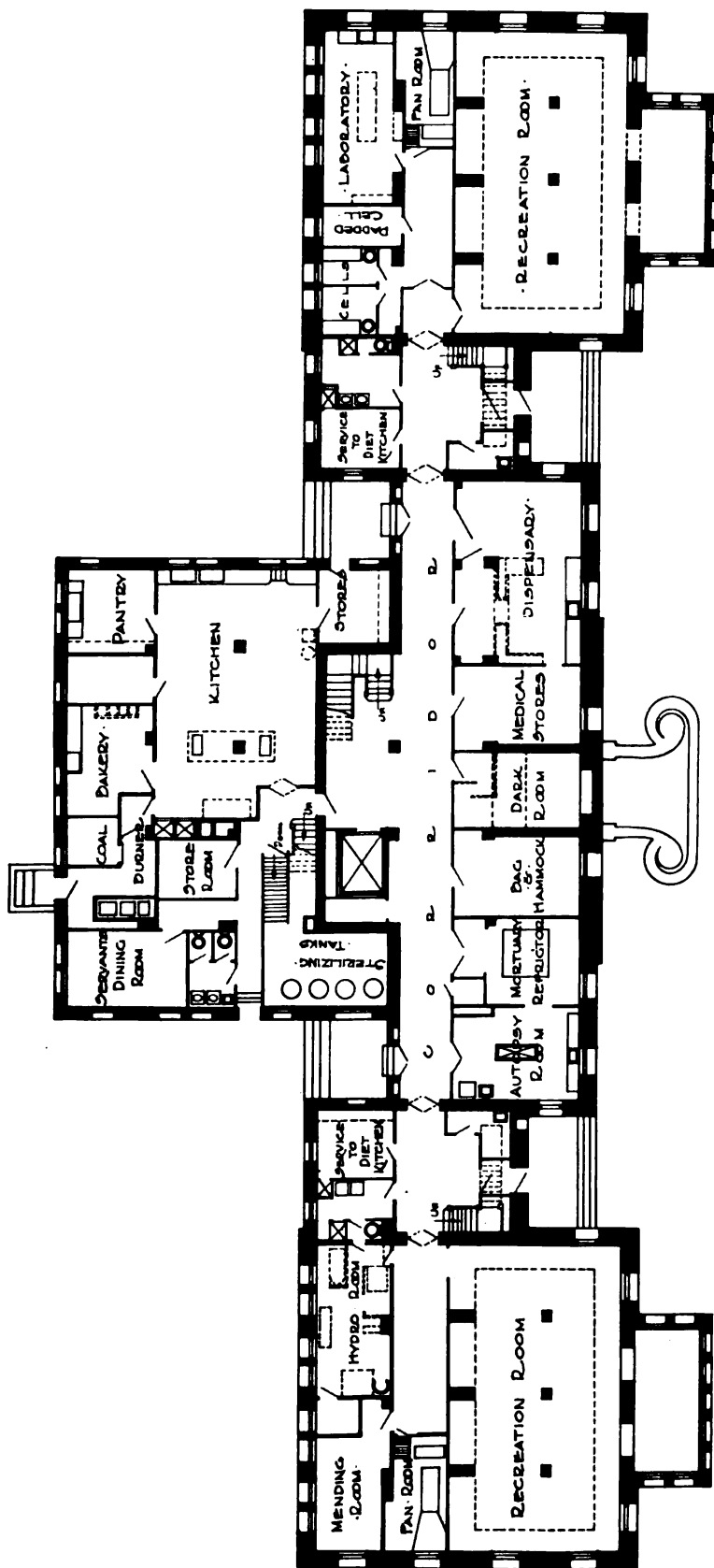
In the rear of the same corridor is a toilet, the elevator, X-ray room, and in the rear annex the mess rooms for convalescents, nurses, and Hospital Corps men.

The front part of the second floor has rooms, baths, and toilets for 6 officers. The operative department occupies the entire rear extension, the operating room being at the extreme end. The various accessory rooms, such as the surgeons' preparation rooms, dressing, sterilizing, instrument, anaesthetizing, and recovery rooms, are arranged on either side of the operating room and the corridor leading to it.

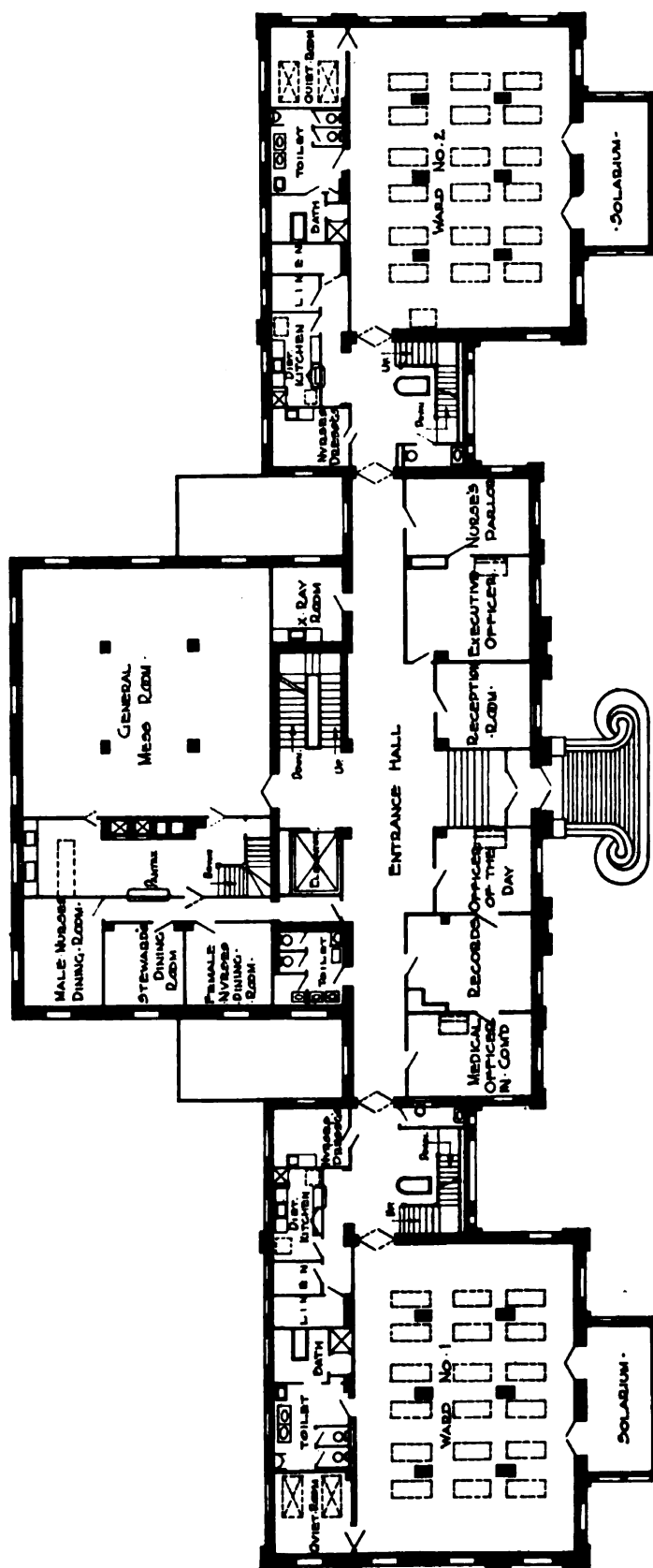
The operating room has the floor and walls finished with "opalite" tiles, the remaining rooms have the floor tiled, the walls finished with Keene's cement and enamel paint. The operating room has a northern exposure and is lighted by lateral and overhead skylights. The air supply for the operating room is forced and its temperature is automatically regulated at any degree between 70° and 90° F. This makes direct radiation here unnecessary.

The third floor of the administration building is limited to the front portion only, the rear annex being but 2 stories in height. On this floor are 9 bedrooms, a sitting room, and 3 toilets, which are available for sick officers, junior medical officers, hospital stewards, or apprentices.

The wings are 2 stories in height with a ward on each floor. They are square with a solarium 11 feet 4 inches by 26 feet built out to the southward. The north side of the wings is given up to the service rooms and a quiet room for 2 patients. The quiet room has double



BASEMENT - PLAN -
 UNITED STATES NAVAL HOSPITAL, GREAT LAKES, ILL.
 This building faces south.



FIRST FLOOR PLAN.

UNITED STATES NAVAL HOSPITAL, GREAT LAKES, ILL.

doors and double hollow tile partitions to deaden sound and the windows are guarded to prevent the escape of patients. These guards are locked on the inside, but can be readily opened from the outside. In a recess for the stairs at the south side of the corridor at the junction of the wings with the administration building is a portable bathtub with a drain, and opposite to this the entrance to a dressing room, the diet kitchen, and the soiled and clean linen rooms, all of which have no direct communication with the ward. Each diet kitchen has an electric range, steam table, plate warmer, and a refrigerator cooled by circulating brine from the ice plant. The diets are hoisted by electric elevators from the basement serving rooms. Soiled linen is transmitted to the soiled linen room in the basement by a chute opening on each floor of the administration building. Each ward has a normal capacity for 18 beds, allowing about 975 cubic feet of air space and 77 square feet of floor space per patient, exclusive of the solarium. The ward receives 7,200 cubic feet of washed fresh air per minute by a plenum system. The air can be maintained at a constant temperature of 70° F. by means of a thermostat. An exhaust system by motor fans in the attic is also supplied, but the pressure in the plenum system is planned to exceed that of the exhaust, thus maintaining a slight pressure in the building. The supply registers are near the floor, the exhaust near the ceiling in the walls and columns.

The flooring in the operating room and its accessory rooms, the hydrotherapy, autopsy, and mortuary rooms, and in the toilets and baths is of a 2-inch hexagonal white vitreous tile.

The sanitary base is of 6-inch tile or cement set flush with the wall and floor. Floors in other rooms than the above, in the wards, and corridors are an 8-inch square compressed cement tile. A "near white" tile is used in the corridors; a dark-red tile with a border of black and white tiles in the wards.

The floor tiling has been very satisfactory, although fine, cobweb cracks have appeared on the surface, but are so minute as to be of no moment. An objection to composition-cement tiling has been made owing to the surface wear producing a fine dust, as has occurred in one recently constructed civil hospital.

The walls in general throughout the hospital have been plastered with U. S. gypsum, plaster of Paris, and lime putty in the proportions of one, one, and two. Where dampness was likely to occur adamant No. 40 was used.

Where the walls are painted they were treated as follows: One coat of Diamond Waterproofing Liquid; second, two coats of white lead and oil paint; third, two coats of Ripolin Enamel, the last coat flowed on.

The color of the paint is as a rule light buff or ecru.

The partitions and wainscot in the toilets and baths are of white marble. The doors to the operating room are metal clad; other doors are flush white-oak veneer.

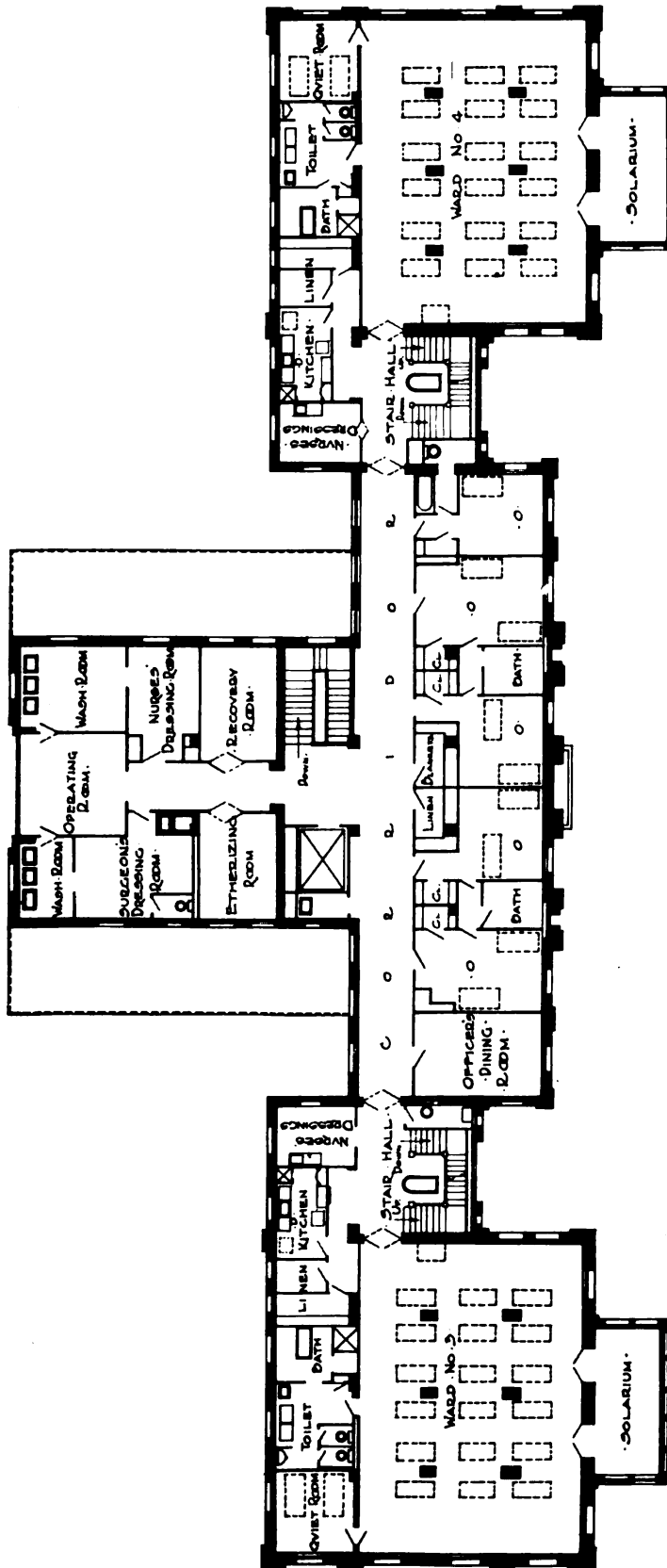
The heating and artificial ventilation are so intimately connected that they will be considered together. A system of direct radiation is provided for all wards, corridors, and rooms, with the exception of the surgical department, the toilets, and adjuncts to the wards. This is supplied by a heater in the sub-basement heated by steam from the power plant and is calculated to supply the loss by radiation through the walls and glass only, but in case of failure of the indirect heating by the plenum ventilating system the heat of the circulating water can be raised by increasing the pressure in the steam coils of the water heater.

Circulation of hot water is maintained by a single-line gravity return main assisted by an electric pump. The indirect heating is combined with the forced-ventilation system, for which two independent plants, one in each wing basement, are provided. Accessory heating coils, under thermostatic control from the wards and rooms, located in attics, heat these spaces and also the operating room from 72° to 90° F., if required. The ventilating units consist of an alternating-current 220-volt, 3-phase, 60-cycle motor operating a belt-driven steel-plate fan capable of delivering an excess of 25 per cent above its normal capacity against a five-eighths-ounce pressure. This fan draws air from the outside, passes it through a spray air washer, over steam-heated coils, forces it through another set of steam coils, thus avoiding scorching the air, then through a humidifier into the supply ducts. The air, when delivered, is required to have a temperature of 72° F. and a humidity of 65 per cent. The heating coils and direct radiators are under automatic thermostatic control. Variations in the amount of air supplied is controlled by dampers, not by changing the speed of the motors.

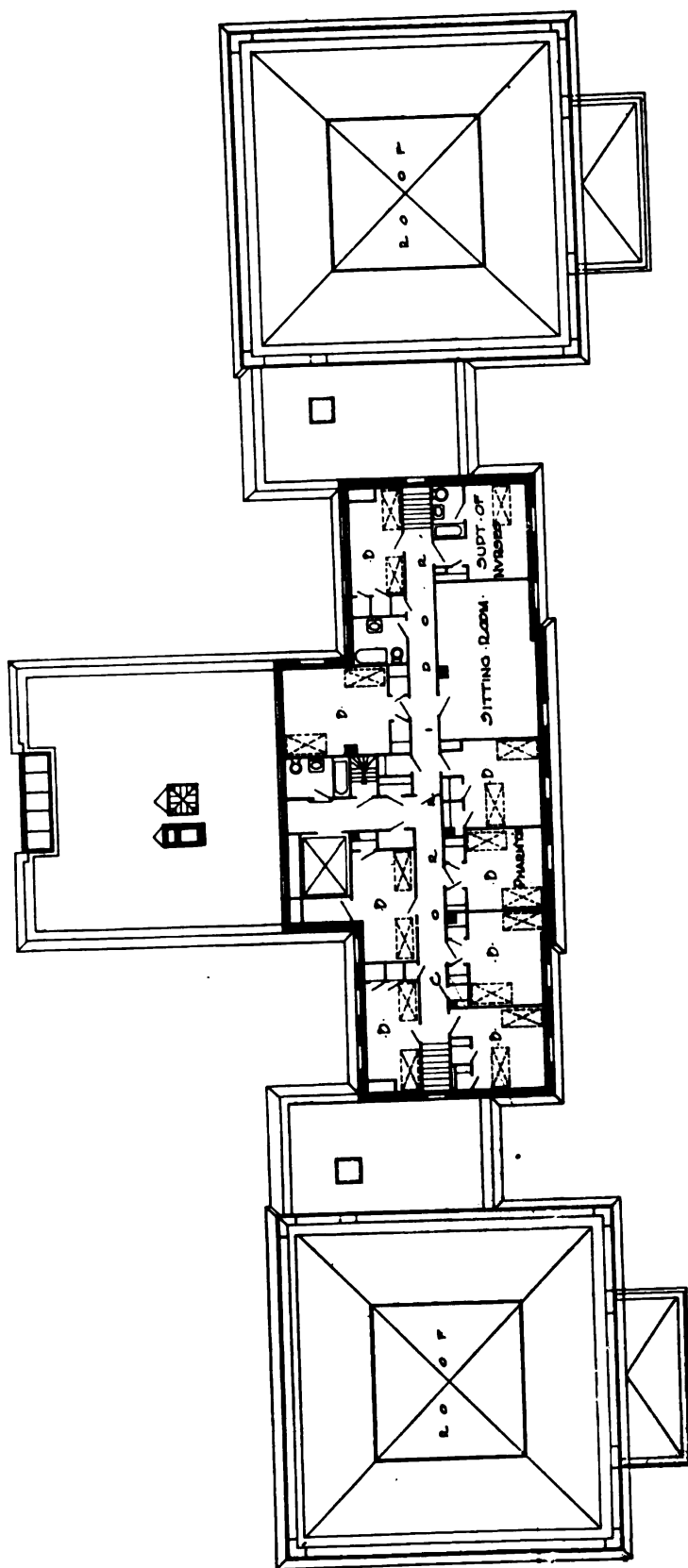
Two exhaust fans in the attic so connected that either can draw the air from all parts of the building provide for the removal of the vitiated air from wards, rooms, and toilets.

The water supply is, in common with that of the naval station, from Lake Michigan, being passed through filter beds before delivery. For all purposes outside of irrigation, fire, power-plant, and sewage-disposal service, the water is sterilized in steam-heated tanks in the sub-basement, which are provided with automatic attachments for regulating the temperature. From these sterilizing tanks hot water is supplied to all parts of the building, and after passing over cooling coils is pumped to the drinking faucets in various parts of the hospital.

Separate sewer systems are provided for the drainage from the toilets, baths, lavatories, and sinks, which is carried to the sewage-



· SECOND FLOOR · PLAN ·
UNITED STATES NAVAL HOSPITAL, GREAT LAKES, ILL.



THIRD FLOOR - PLAN -
UNITED STATES NAVAL HOSPITAL, GREAT LAKES, ILL.

reduction plant, and that from the rainwater and floor, refrigerator, and drinking-water drainage, which is passed through a gravel bed before discharging into the lake.

The plumbing is of the most recent sanitary design. The water-closets are of the flushometer type, exposed-jet, rim-flushing, and operated by a plunger-type, lever-handle, direct-pressure valve working in an oil chamber, and, except in the officers' rooms, are uncovered. The slop sinks have flushometer attachments and rim-flushing device, and those in the toilets have a hot and cold water jet for sterilizing and cooling utensils and are operated by knee-action valves.

Artificial illumination throughout is by electricity. The interior fixtures are plain brass with an antique finish. The ceiling lights are 9 feet 6 inches from the floor. Wall lights for the beds have extension arms with a socket joint and have adjustable shades. Standing lights are controlled by cut-outs in the office of the officer of the day and have reflectors to diffuse the light on the ceiling. All lights are covered by plain round pattern globes with a sand-blast finish.

The passenger and diet elevators are operated by electric motors controlled by push buttons from each floor. The former may also be actuated by a controller in the car. The car is provided with a foot-lever door opener, but no door can be opened unless the car is at that landing. The presence of the diet elevator at any floor is indicated by a light over the door. The car can not be operated while the door at any floor is open.

In addition to a complete telephone installation, this hospital has a system of nurse calls and nurses' emergency calls, which, if not too easily deranged, is a great improvement over call bells, obviating noise, and also insuring prompt attention from the nurse. The nurse call is operated by a push button convenient to the bed, which turns on a small electric light over the patient's bed in the ward or over the door of the room, and also one in the case at the nurse's station and a corresponding one in the head nurse's case, showing the number of the bed or room. These lights can be extinguished only by means of a resetting button at the bedside of the sending party. To attract attention the call is accompanied by a momentary action of a buzzer.

The emergency call is for the use of the nurse and is operated by a push button at the nurse's station or from rooms. This turns on a red light in the head nurse's case, and also one at the sending station.

These lights can be reset by means of a key at the sending station only.

A vacuum cleaning machine with outlets conveniently situated in all parts of the building is provided with attachments for cleaning floors, walls, and furniture, and prevents in a large measure the

dissemination of disease by dust. The discharge from this machine is provided with dust separators.

The refrigeration of the cold-storage room, diet-room refrigerators, drinking water, and the two receiving vaults in the morgue is accomplished by a 3-ton carbonic anhydride ice machine located in the sub-basement, from which the brine is pumped to coils in the above locations.

A garbage burner adjacent to the main kitchen provides for the incineration of soiled dressings and table and kitchen waste.

The hydrotherapeutic room has needle and rain showers, a continuous-flow bath, a sitz bath, jet and spray nozzles connected with a controlling table, which permits the use of water at any desired temperature or pressure. Shampoo and massage tables with vibratory machines, hot-air and electric-light cabinets, a fomentation sink, warming oven, a hot pack room, and the usual toilet facilities complete this installation.

The kitchen equipment is similar to that supplied the naval hospital at Norfolk, Va.—a French hard-coal range, a gas range, a charcoal broiler, steam cookers, copper steam kettles, steam cereal cookers, coffee, tea, and beef-tea urns. The diet kitchens have electric ranges, a steam serving table, and a plate warmer.

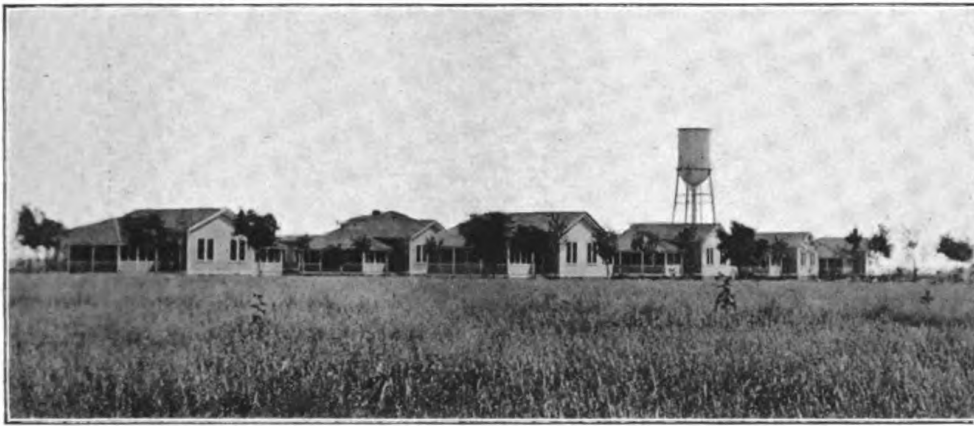
The congressional appropriations of \$250,000 have been supplemented by an allotment from the naval hospital fund of sums aggregating \$157,513 for the construction of the laundry and disinfecting plant and three sets of officers' quarters; for heating and electrical distribution; water, sewer, and drainage systems and roads; and a contagious-disease hospital. A stable and garage is being erected which will cost about \$3,000, chargeable to the naval hospital fund.

The total normal capacity of the hospital is 80 beds for enlisted men and 9 for officers. The cost per bed of the main hospital is \$2,629.

NAVAL HOSPITAL, LAS ANIMAS, COLO.

Subsequent to the Spanish-American War the rapid expansion of the personnel of the Navy was responsible for a marked increase in the number of tubercular cases in the service. Camps were established at most of the naval hospitals for the fresh-air treatment of the disease, and isolation camps were started at Pensacola, Fla., and Port Royal, S. C., but at none of these places was the climate and environment all that could be desired.

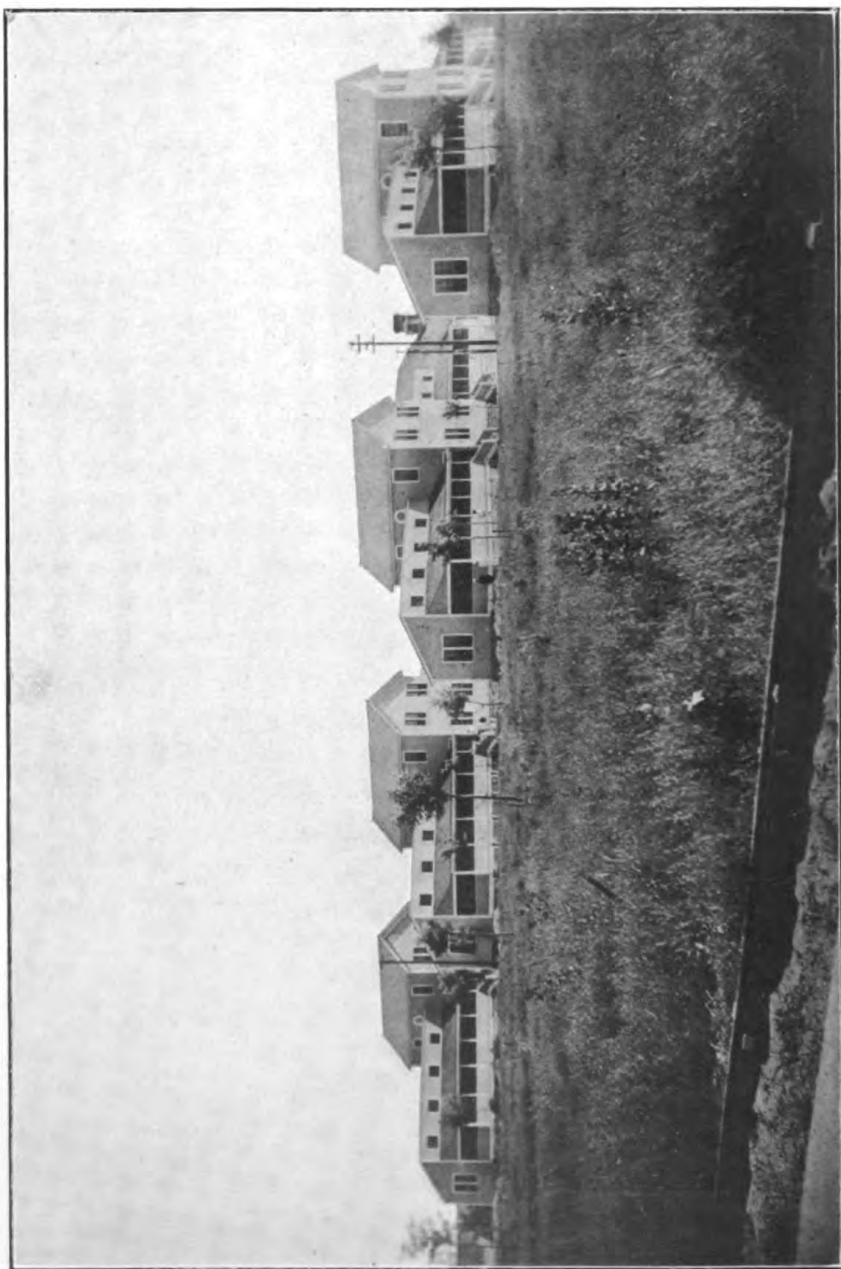
In 1906, after several years of urgent pleading by Surgeon General P. M. Rixey, United States Navy, the military reservation at New Fort Lyon, Colo., was transferred to the Bureau of Medicine and Surgery for use as a tubercular sanatorium. This selection was



Sick officers' cottages, viewed from the south.



A portion of the reservation, looking south from water tower.
UNITED STATES NAVAL HOSPITAL, LAS ANIMAS, COLO.



"Lean-to" wards, viewed from the southwest.
UNITED STATES NAVAL HOSPITAL, LAS ANIMAS, COLO.

made after an inspection of the abandoned military reservations available without expense, there being no funds appropriated for the purpose. The site selected contains about 575 acres, located on a bluff about 60 feet above the Arkansas River and 3,800 feet above the sea level.

The climate is such as to permit patients to live out of doors practically the entire year. The summers are warm, but cool at night, and the winters are not excessively severe. About 85 per cent of the days are sunshine, the annual rainfall being about 11 inches. An objectionable feature is the high winds and dust storms, but with the introduction of irrigation and the consequent growth of vegetation this is expected to be remedied.

With the reservation a number of disused buildings, in consequent bad repair, came into the possession of the Navy. Of these, five houses on the north side of the parade ground were repaired and are utilized as quarters for the medical officer commanding and the staff. On the south side of the parade ground is the administration building, and on the west side the former barracks have been reconstructed into a building for 54 ambulant cases. On the east side of the quadrangle are six buildings of recent construction. Each consists of two "lean-to" wards of eight beds capacity, abutting on a two-story central building in which are the utility rooms, a warm sitting room, and quarters for the Hospital Corps men. The buildings face toward the south, on which side is a veranda protected by a low balustrade. Opposite each bed the ward opens on the veranda by double doors, allowing the bed to be wheeled directly into the open air. A special subsistence building is provided for the wards.

The former post hospital, located northeast of the above, has been rebuilt and increased in size and is used as an infirmary for enlisted patients. It has a kitchen, mess room, laboratory, operating room, and accommodations for 44 patients.

The sick officers are provided for in a group of buildings at the northwest part of the grounds, consisting of eight cottages with four rooms in each for ambulant cases and an infirmary for the more severe cases. A subsistence building is provided in the rear of the cottages. The latter face toward the south, on which side the verandas are placed. They are arranged in the form of a broad V inclosing the subsistence building and the infirmary. This arrangement prevents one building from interfering with the sunshine and ventilation of another. Each room in the cottages opens directly on the veranda. In the infirmary, besides six rooms for patients, there is a diet kitchen and a throat and nose treatment room.

Quarters for the pharmacist, hospital stewards, and civil employees are situated on a line with and in the rear of the commissioned officers' quarters and on the west side of the parade ground.

The entire institution is supplied with power, heat, electric light, and water from a central power plant located to the eastward of the hospital. This plant also runs a 2-ton ice plant and a steam laundry. Water is obtained from artesian wells and is stored in a 100,000-gallon tank. For irrigation purposes water rights have recently been obtained from the Fort Lyon Canal Co.

A special crematory for sputum and other infected material has been provided. To combat ennui and nostalgia incident to the isolation, as well as to give an outlet for the exuberant spirits of the convalescents, various forms of recreation, such as a bowling alley, pool and billiard tables, a small theater, and, for exercise in the open air, tennis courts have been provided.

The capacity for patients is 232 beds, of which 38 are for officers. The hospital was placed in service immediately upon transfer by the Executive order dated October 25, 1906, the patients being quartered in tents until other accommodations became available. A mortuary, a telephone exchange, a garage, and a steam disinfecting plant have recently been completed.

The total cost of this institution for repairs and new construction has been \$481,212, which has been defrayed from the naval hospital fund.

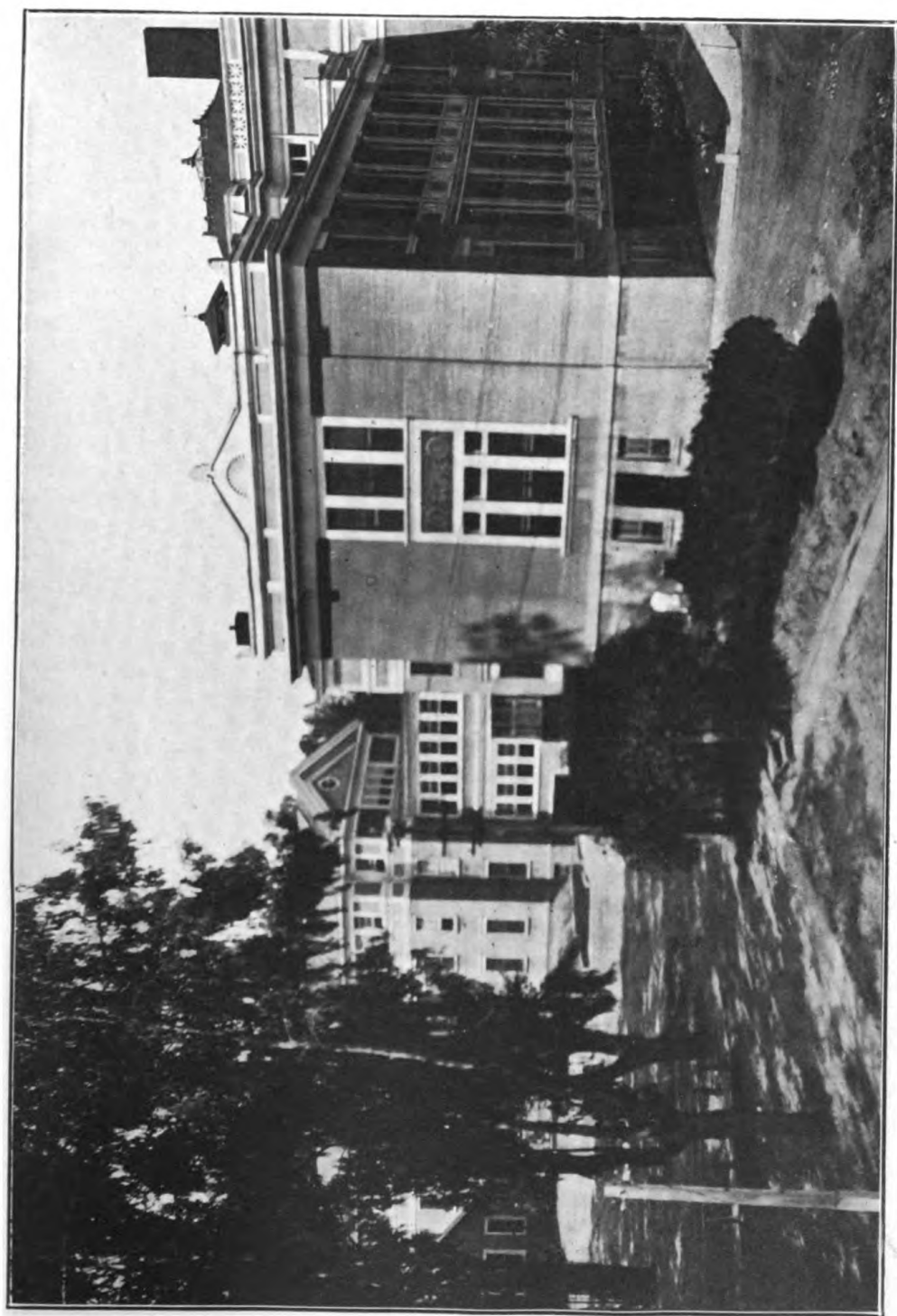
The cost of construction and maintenance is high owing to the distance (5 miles) of the nearest railroad station, Las Animas, Colo.

The daily average number of patients treated at this hospital during the year 1909 was 176. While the improvement in their condition is gratifying, the value of the sanatorium as a means of preserving the services of trained officers and men for the Navy has been practically nil, the few cases returning to duty having almost invariably suffered a relapse under service conditions.

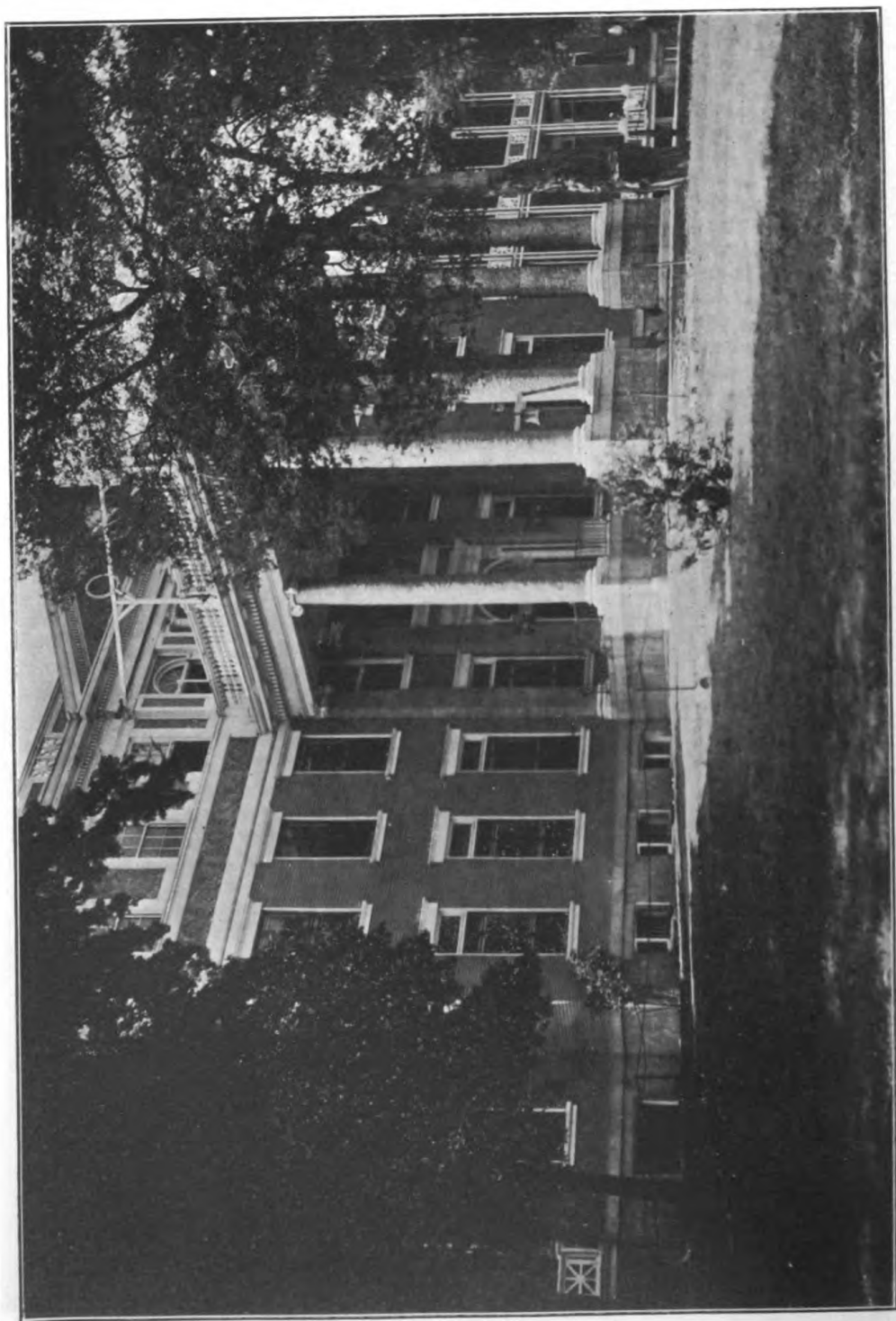
NAVAL HOSPITAL, MARE ISLAND, CAL.

The brick hospital erected in 1870 was so severely damaged by an earthquake in 1898 that it was condemned and torn down. An appropriation of \$100,000 for rebuilding was made immediately available by Congress (naval act of May 4, 1898), and a contract was let in October, 1898, for the sum of \$72,441, but owing to changes in the plans and to defective work the entire appropriation was exhausted when the work was completed, April 3, 1900.

The new building is on the same lines as the old one. The structure is wood, principally California redwood, securely braced by large beams of Oregon pine. The plan is that of a pavilion hospital with a central administration portion and a rear subsistence and operating extension of three stories and lateral ward wings of two stories. A common basement extends beneath all parts. It contains in the wings a fan room, connected by ducts with registers beneath



South ward and recent addition running west with connecting solarium.
UNITED STATES NAVAL HOSPITAL, MARE ISLAND, CAL.



Entrance to main hospital building.
UNITED STATES NAVAL HOSPITAL, MARE ISLAND, CAL.

each bed. The fan is designed to exhaust the vitiated air from the wards. The remainder of this space is partially occupied by the cells for prisoners, storerooms, machine shop, and rooms for the Chinese employees.

The central part on the first floor contains the executive offices, a library, a board room, and officers' and Hospital Corps men's mess rooms; on the second floor originally were three suites for the medical staff, which have since been reconstructed into two wards of 12 beds each, and two suites, one reserved for a junior medical officer, the other assigned to the nurses on duty.

On the second floor connection has been made in the rear with the corridor to the new wards; the former operating room has been assigned for use as a bacteriological laboratory.

The employees have been removed from the third floor and these five rooms fitted for sick officers.

On the third floor, in front, are eight rooms with baths for sick officers and a hospital apprentices' room. In the rear extension on the first floor is the main kitchen, pantry, and mess rooms with tiled floors and wainscot. On the second floor is the dispensary, X-ray rooms, and laboratory.

The wards are 71 by 28 by 15 feet and have transverse projections at each end, that at the outer end having toilets and baths and a dressing or quiet room, the one at the inner end the attendants' rooms and linen locker. The normal capacity of the ward is 20 beds.

The natural ventilation and illumination of the wards is excellent. In addition to the former, an exhaust system is provided by means of electric fans in each basement connected with registers beneath each bed. The omission of diet kitchens for the wards was a serious one, which, up to the present time, has not been remedied.

An electric passenger elevator as originally installed extended only to the second floor, but has since been continued to the third floor of the central building.

The hospital faces the northeast and toward Mare Island Channel. In the rear an elevation of land affords shelter from the chilling bay winds. The grounds are laid out in lawns and flower beds, which, with the numerous trees, render the environment delightful.

In 1900 the old power and gas house, situated to the eastward of the hospital, was condemned. Under an appropriation of \$10,000 (naval act of June 7, 1900) a new power house of structural steel, brick walls, and a terra-cotta roof was erected by the Bureau of Yards and Docks.

Two 45-horsepower, horizontal, tubular boilers were installed in one end of this building and a modern steam laundry in the other. During the year 1901 a frame structure in the rear of the main hospital, which was erected for use as a storeroom during the period of re-

building, was converted into two wards of 20 and 10 beds capacity by the addition of a veranda and utility rooms. One of these wards has recently been subdivided into rooms for civil employees.

The naval act of July 1, 1902, authorized the sum of \$30,000 for the building of two sets of junior officers' quarters, the alteration into wards of rooms in the hospital, formerly occupied as quarters by them (\$20,000), and the erection of an isolation building (\$10,000). The quarters were erected on the slope below the medical director's house, facing the southeast. The contagious-disease hospital has one ward containing 10 beds, connected by a solarium and mess room, with a two-story part containing an office and a bedroom for a medical officer, 2 quiet rooms, and kitchen. This building is about 500 feet from the main hospital.

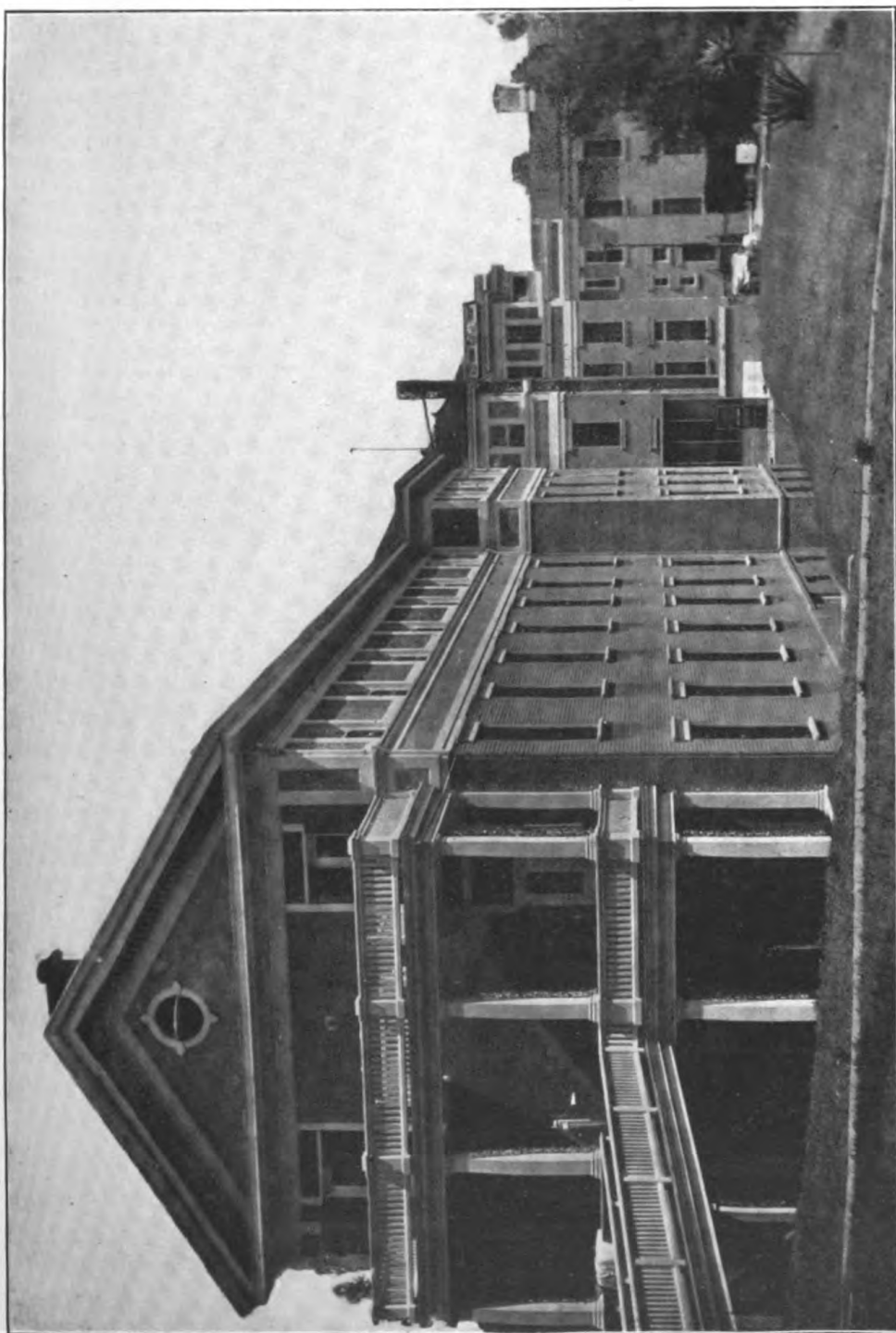
In 1905 an appropriation of \$25,000 (naval act of June 29, 1906) was made for the building of an additional surgical ward and operating room (\$12,000), a new isolation building (\$8,000), and power plant (\$5,000). This appropriation, manifestly inadequate for the purpose, has been supplemented by allotments from the naval hospital fund, amounting to \$50,000, the total cost of these buildings aggregating \$75,000.

The extension of the power plant was accomplished by removing the steam laundry from the power house, giving space for an additional boiler and a machine shop. The old power house was reconstructed into a laundry and provision made for various shops and storerooms. The addition of a second story to this building is contemplated, which will give accommodations for the civil employees.

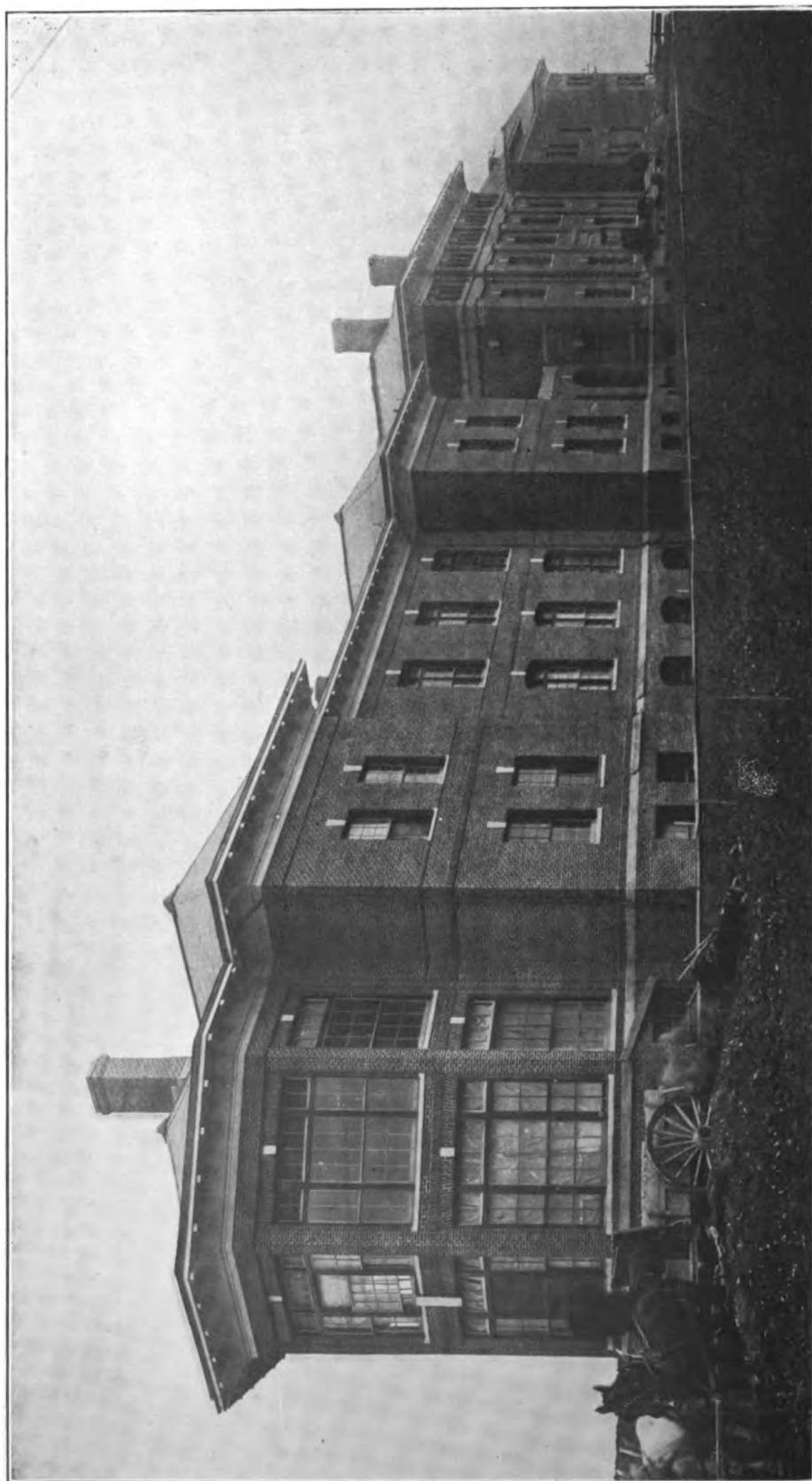
The extension of the isolation building consists of two 8-bed wards, one on each side parallel with the original ward, connected with the administration building by a 15-foot corridor. This gives accommodations for 28 beds in this building. In addition to the above a camp, formerly used for tubercular patients, located on the slope midway between the above building and the main hospital, is available for isolation purposes. This camp is provided with running water and toilet facilities.

The new wing and operating room has recently been completed. It is in the rear of the kitchen and former operating extension, being connected with it by a corridor over the roadway. This corridor is inclosed by glass and serves as a solarium.

The wing is 129 feet by 32 feet and is similar in construction to the main hospital. It consists of a basement, extending 80 feet beneath it, and 3 stories. The basement is occupied by the hydrotherapeutic rooms, a lounging room, morgue and autopsy room, bag and hammock and disinfecting rooms, and a fan and heater room. The first floor has accommodations for 10 hospital apprentices and 2 hospital stewards and mess rooms for the Hospital Corps and patients. On the



Recent addition and rear of main hospital building, viewed from the west.
UNITED STATES NAVAL HOSPITAL, MARE ISLAND, CAL.



FRONT OF MAIN HOSPITAL BUILDING.

Typical of new United States Naval Hospitals at Portsmouth, N. H., Chelsea, Mass., and Newport, R. I.

second floor are the X-ray and dark rooms, a "strong" ward of 6 beds, two 3-bed quiet rooms, service rooms, and an 18-bed ward. The third floor is occupied by an 18-bed ward with the usual toilets, lavatories, and diet kitchen, and at the front end the surgical suite, consisting of two operating rooms, surgeons' preparation room, sterilizing, general dressing, anæsthetizing, and recovery rooms.

An electric elevator runs from the basement, where there is an entrance for patients, to the top floor.

The interior finishing is more modern than the main building. The hydrotherapy room, "strong" ward, serving rooms, diet kitchens, mess rooms, and toilets have floors and wainscots of 1-inch hexagonal tiles. The operating rooms and accessory rooms have the floor tiled and a wainscot 11 feet 6 inches high of 2-inch hexagonal tiles. The walls are finished with Keene's cement and enamel paint. The ceilings are of pressed steel. The floors throughout the hospital, except where tiled, are of yellow Georgia pine waxed and polished. The new wing has both a plenum and an exhaust system of ventilation, the fans being located in the basement and in the attic.

All the buildings are heated by low-pressure steam from the power plant, with the exception of the isolation building, which has in independent hot-water system. The surgical suite has a heating stack for the plenum system.

The normal capacity of this hospital, as based on the plans, is now 220 beds, distributed as follows: Main hospital, 162; temporary ward, 30; isolation building, 28.

The reservation has recently been increased by a strip of land 300 feet wide and 1,500 feet long leading to the water front. A road will be built and a landing provided where patients can be landed from vessels in the stream.

The members of the Nurse Corps attached to the hospital are at present quartered in Vallejo. The construction of quarters for them is under consideration.

THE NEW NAVAL HOSPITALS AT PORTSMOUTH, N. H., CHELSEA, MASS., NARRAGANSETT BAY, R. I., AND PUGET SOUND, WASH.

For the purpose of securing economy in construction and a desirable uniformity in design, these hospitals are building under a common plan which is believed to combine convenience in administration and adaptability for extension in time of war. This plan is referred to as the "type" naval hospital plan and with slight modifications is adapted to the subtropical as well as the Temperate Zone stations.

The complete institution under this plan includes, besides the main hospital of 134 beds, a contagious disease hospital of 40 beds; a power, laundry, and disinfecting plant; officers' quarters; nurses'

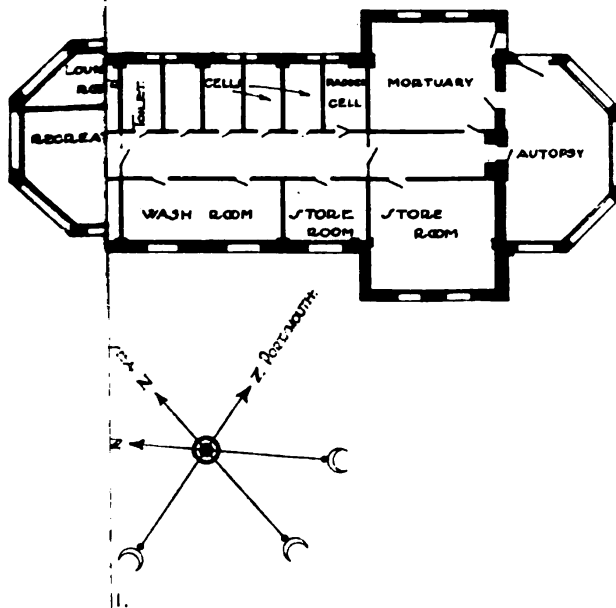
quarters (where quarters elsewhere are not available); a stable and greenhouse. The general arrangement of the main hospital resembles a T, the central administration portion with the lateral wings forming the top, the subsistence and operating building with the solarium and connecting corridor to a rear extension of the main part forming the vertical stem of the letter. The total frontage is 383 feet, of the administration building 68 feet 8 inches, of the wards 123 feet 6 inches. The wards, four in number, are in the wings, connected with the administration building by solarium corridors. The administrative parts are sufficiently large to serve an extension of the ward space. Additional wards can be erected in the rear of and parallel with each wing, there being sufficient room for two additional wings on each side, thus increasing the total ward capacity to 360 beds, or without serious crowding to 400 beds. These wards would have connecting corridors to the central solarium and the central office building.

The arrangement of the remaining buildings will vary according to the space available and to topographical conditions. As a rule the power plant and stable will be well to the rear of the main hospital, the contagious building to the leeward as regards the prevailing wind, the staff quarters in line on one side and facing the hospital grounds.

The orientation of these buildings is such as to give the maximum exposure of all parts to the sun and a northerly one to the operating department.

The construction is fireproof; of structural steel framework; brick walls, the exterior walls a dark red; the floors and upper story ceiling reenforced concrete; the roof of slate.

The interior is simple in finish, free from unnecessary projections, and all corners are rounded to facilitate cleaning. Partitions are of brick or terra-cotta tiles. The plastering throughout is hard plaster, that used in the operating suite, toilets, baths, disinfecting, mortuary and autopsy rooms, as well as in rooms receiving hard usage, such as the kitchens, cleaning gear, and recreation rooms, etc., being Keene's cement plaster. Plastering elsewhere is King's Windsor cement, a hard plaster nearly as hard as Keene's. The first or scratch coat is mixed in the proportions of 1 part of Windsor cement to $1\frac{1}{2}$ parts of sand. The second or brown coat is mixed in the proportions of 1 part of Windsor cement to $2\frac{1}{2}$ parts of sand. The third or finish coat is mixed in the proportions of 1 part of lime to 2 parts of Windsor superfine cement plaster. The preceding three coats are used on all lathed surfaces, and the first or scratch coat is omitted from brick, terra cotta, and concrete surfaces. The finished coat of plaster has a certain amount of lime added to give uniformity in color, but not enough to appreciably soften the plaster. King's Windsor cement



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plaster without lime mottles badly. The walls where a wainscot is not provided are painted a light buff color. A cast-iron base has been used in these hospitals, and is found to be reasonable in cost and less likely to be broken than is tiling. It is set flush with the floor and walls and is treated as follows: One coat of red lead and oil as a primer; two coats of lead and oil, and then one of spar varnish colored slightly. The operating suite has a 7-foot wainscot of gray Tennessee marble; the floors, of tiles of the same material laid on nonstaining Portland cement on concrete. Gray Tennessee marble was selected on account of its durability, hardness, and fineness of texture, rendering possible the making of close joints, and also largely on account of its resistance to the chemicals in use in the operating room. White marble is less resistant to chemicals, while glass or opalite is likely to chip or spall, and is slippery. Interior floors are flush surface and the woodwork devoid of unnecessary moldings. The muntins and window sashes are especially designed to dispense with as many fillets as is possible.

The floors in the main kitchen, pantries, nurses' dressing rooms, toilets, the mortuary and morgue are finished in 3-inch hexagonal vitreous tiles selected on account of their durability and hardness.

Several modern civil hospitals were visited to determine what material is best adapted for flooring in the wards, rooms generally, and the corridors, and as a result long-leaf yellow pine, quarter-sawed, heart-stuff, was selected as being reasonable in cost, remaining well in place and taking a fine finish. While maple is harder it has a tendency to curl; terrazzo is suitable over small areas only, as it has a tendency to crack, is noisy, and tiring to the feet. Linoleum well laid and turned up at the walls to form a cove is very satisfactory, but is expensive, and if poorly laid tends to buckle and open at the joints. While not yet entirely satisfactory, the composition floor will probably be developed into the ideal material for institutional use.

The interior woodwork, in general, has three coats of Pratt & Lambert's Public Building varnish rubbed to a dull finish in addition to a priming coat of shellac.

Exterior woodwork, except oak doors, has three coats of lead and oil paint, colored dark green for pine doors, sashes, and their frames, and colored cream white for all other exterior work.

The plaster walls in operating suite, in mortuary, autopsy, and disinfecting rooms in basement, and in baths, toilets, diet kitchens, nurses', and dressings rooms above basement have one coat of sizing, one coat of lead and oil, and two coats of Ripolin enamel, with the final coat tinted and rubbed to a dull finish. The woodwork, except doors, in these rooms has a coat of shellac as a primer, one coat of lead and oil, and three coats of Ripolin enamel, with final coat tinted

and rubbed to a dull finish. The metal doors in operating suite have a mineral primer and two coats of white japan baked on and rubbed to a dull finish. The wood doors in these rooms are varnished as above noted for interior woodwork.

Basement walls and ceilings, not otherwise treated and except where they are face brick, and walls and ceilings in all cleaning-gear closets are painted two coats of Keystone.

All surfaces in X-ray and photography rooms have three coats of dull black paint.

Wood floors and wood stairs are finished with three coats of Boyles Old English floor wax.

In the basement beneath the central building are three dining rooms for attendants, serving rooms, the heater and fan room, the elevator shaft and machinery, and a closet for cleaning gear. This latter room and similar ones elsewhere have special provision for the sterilization of mops and utensils used in cleaning. The dispensary, with an adjoining storeroom, is located in the front part of this basement.

The basement of the right wing contains a recreation room, a library, a hydrotherapeutic room with an adjoining lounging room, a serving room with a dumb-waiter to the wards above, a linen room, a bag and hammock and other storerooms.

In the basement of the left wing at the extreme end is a mortuary and an autopsy room completely tiled and drained. The entrance to these rooms is from the exterior of the building. Adjacent to the above are cells for prisoners and the insane, for whom are provided special toilets and lavatories, the whole being separated from other parts of the hospital by strong wire netting. The remaining space is occupied by the X-ray, developing, disinfecting, and store rooms. In the rear at the junction of these rooms with the main building is a room to receive the soiled linen from the wards above through a chute. This room has an exterior door only, to prevent possible infection of the basement and to afford easy access to the infected end of the disinfecting plant. It was the intention that all soiled linen should be packed in canvas bags before they are dropped down the chutes.

The lighting of these hospitals was carefully gone over by Civil Engineer A. L. Parsons and by Passed Assistant Surgeon H. W. Smith, United States Navy, both of whom had made exhaustive tests on lighting for the Naval Academy at Annapolis. Holophane globes are used to throw the light and distribute it as required.

For wall brackets, asymmetrical globes No. 295 were chosen; for ceiling fixtures for general use, intensive globes No. E-3363; for operating rooms, for rooms for general dressings and for autopsy, intensive globes No. 1-9. The height of wall brackets is 7 feet above floor; of ceiling lights 8 feet 6 inches to globes; of operating-room lights

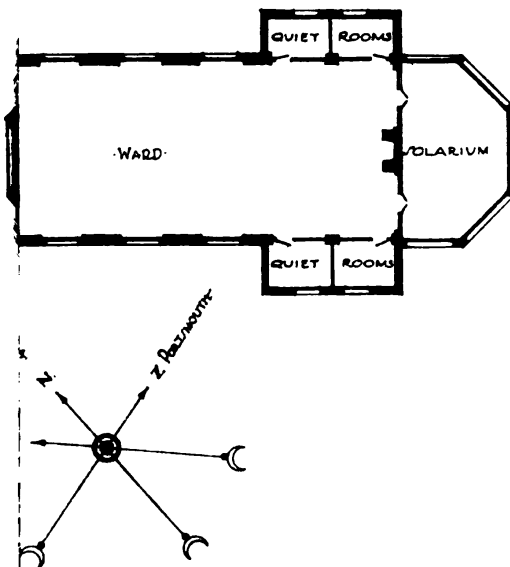
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and lights in rooms for general dressings and minor surgery, 8 feet to globes. Fixtures are of drawn brass, simple in design, and of substantial character. The wall brackets finish closer to the walls than the usual fixture and the asymmetrical globe throws the light out into the room. All fixtures are arranged for the use of Tungsten lights.

The main entrance to the hospital on the first floor of the administrative portion is reached by broad granite steps, on each side of which is an ornamental pedestal light. The area at the top of the steps is tiled and has Luxfer prisms inserted to give light to the basement rooms below.

Access to the entrance corridor is through two double swinging doors and a rubber-tiled vestibule. From the entrance, corridors extend to the solarium and subsistence building in the rear and laterally to the wards. Forward of the latter to the right of the entrance are the offices for the medical officer commanding and the record clerks; to the left, those for the officer of the day and the executive surgeon. In the rear extension is the board or examination room; a room for treatment of diseases of the eye, ear, and throat; the laboratory, and quarters for a junior medical officer or the officer on duty. An alcove adjacent to the elevator serves as a reception room.

The second and third floors are assigned to sick officers, for whom 15 rooms are provided. As a rule, there are lavatories between each two rooms. The officers' dining room is on the second floor, and a large recreation room is situated on the third floor. Serving and dressing rooms are provided on both floors.

The subsistence-operating building is 72 feet to the rear of the central executive portion and connected on the basement, first and second floors by corridors inclosed by glass, which are expanded at the middle portion into solaria. The third-floor corridor communicates with the main building, and aside from a canopy over the central portion is entirely open for the treatment of cases requiring outdoor living. In the basement of this building is the main kitchen, cold-storage room, storerooms, serving room, and a blower room. The kitchen is large, completely tiled, and supplied with the most improved culinary appliances. The diets are transferred to the general mess room above by a dumb-waiter and to the serving rooms in the basement by metal food carriages.

On the first floor are the main mess rooms for the convalescents and nursing force, a pantry, and dish-washing room. The latter is equipped with a mechanical dish washer.

The second floor is occupied by the operating department, the arrangement of which is varied in the four hospitals to give the most desirable exposure to the operating rooms. In addition to the general operating room are provided a general dressing or minor surgery room, a cystoscopic room, surgeons' dressing and prepara-

tion rooms, nurses' preparation room, sterilizing, anæsthetizing, and recovery rooms. The operating rooms have lateral and ceiling skylights. Artificial light is provided by five 50-candlepower electric lights with holophane reflectors, so arranged as to prevent the casting of shadows on the field of operation.

The equipment is complete in every detail; the plumbing is of the latest design; all faucets and drains are provided with knee-action valves. The drains can be flushed with boiling water. All plumbing fixtures and fittings throughout were chosen with especial care and are of simple, durable patterns. The exposed metal fittings are of "red metal" composed of not less than 70 per cent copper. Red metal can be polished and worn indefinitely and still show the same color. Nickel plate will sooner or later wear off in places, leaving unsightly spots. Volume valves are used on all lavatories, sinks, and baths to control the flow of water, in addition to the usual faucets, to prevent splattering walls and floors by the full quick opening of the faucets.

The wards have a normal capacity of 26 beds, allowing 92 square feet of floor and 1,250 cubic feet of air space per patient. In addition there are four one-bed quiet rooms connected with each ward, located two on each side of the ward near its outer end. These rooms have double hollow tile partitions and double doors to exclude sound.

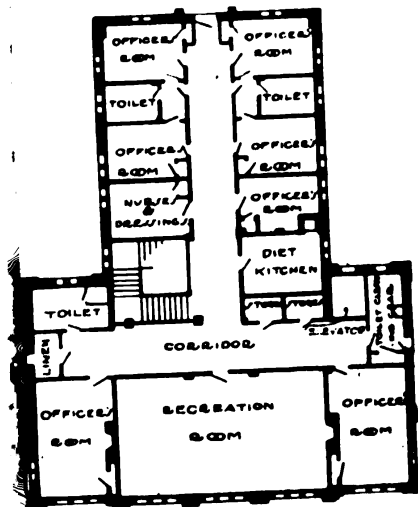
The solarium is at the outer end of the ward, embracing its entire width, and is inclosed in glass on three sides. Additional solarium space is provided by a loggia between the ward and the administration building in front of the corridor. The wards are bright, having 14.8 square feet of glass per bed.

The utility rooms are at the inner end of the ward, opening on the entrance hall. A fireplace at the outer end of the ward assists in ventilation and adds to the cheerfulness.

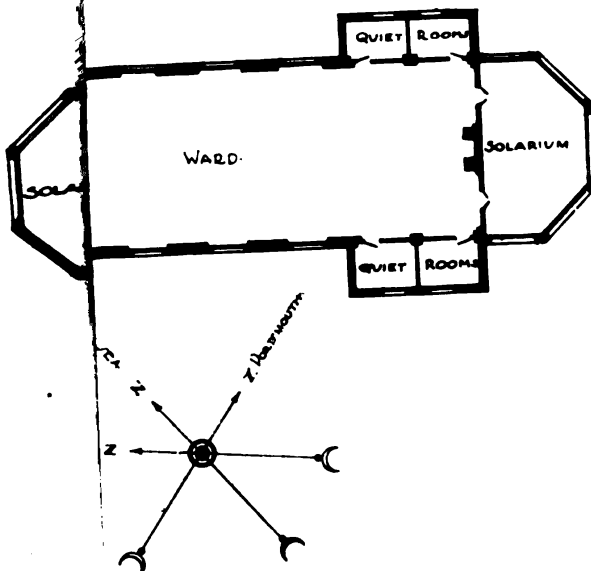
In accordance with modern practice, two systems of heating are employed, direct and indirect from a hot-water system and indirect by means of the plenum system of ventilation.

The hot-water system is calculated to maintain a temperature of 70° F. in zero weather. Direct radiators are provided for the wards and direct-indirect radiation for rooms not provided with forced ventilation.

The mechanical combined heating and ventilation plant consists of two units—one supplying 3,000 cubic feet of washed air per minute to the subsistence and operating building, the other supplying 3,400 cubic feet per minute to the administration building and wards. The latter supply is passed through a fine screen to remove débris, but is not passed through a water air washer. The air is passed over tempering steam coils, which heat the air, when required,



THIRD FLOOR PLAN
ADMINISTRATION BLDG.



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to 45° before passing to the fan; there it is passed over a reheating coil and the temperature raised to 75° F. The regulation of the heating coils and also of the damper to a by-pass allowing admixture of cold air with the heated air is under thermostatic control from the living spaces. The hot-air ducts open into the wards 8 feet above the floor. Four exhaust blowers, located in the attic over the wards, administration building, and operating building, are connected by ducts with registers 1 foot above the baseboard. By this method the heated fresh air enters high up and becomes thoroughly disseminated, cools, and gradually falls, passing out at the exhaust registers near the floor.

The hospitals are provided with intercommunicating telephones, fire-alarm boxes, and gongs. A special fire pump is provided to afford ample pressure under all conditions.

The water supply, other than for fire and sanitary purposes, is passed through a Loomis-Manning water filter of a capacity of 18,000 gallons per diem.

The vacuum cleaning system consists of a vacuum equipment located in the heater and blower room in the basement of the administration building, with thirteen 1-inch outlets located at central points, as follows: One each in basement, first, second, and third stories of administration building; one each in basement, first and second stories in each of the two ward wings; and one each in basement, first and second stories of operating and subsistence building.

Each outlet has a polished brass cover. The outlet caps are hung on a chain when off the opening. The openings are provided with a cock to prevent the noisy inrush of air when cap is removed.

There is provided 100 feet of vacuum hose in two 50-foot lengths, with nickel-plated fittings. Also two complete outfits of renovators arranged in hardwood cases for storing when not in use. The renovators are polished aluminum and nickel-plated brass.

The separator is the latest automatic type which cleanses the dust-laden air by drawing it through a body of water which is changed at intervals automatically, the interval of change being regulated according to the amount of work being done by means of the admission valve on the water pipe. A glass peephole on the front of the separator gives a view of the contents as a check on the adjustment of the rate of flow.

The vacuum pump is of the double-acting, reciprocating vertical type, driven by a 7½-horsepower motor with silent chain drive, all mounted on one base. The pump has a cylinder 13 inches in diameter, with a stroke of 6 inches, and displaces 160 cubic feet of free air per minute with 175 revolutions.

An independent switchboard is provided for this equipment, and the system is provided with an unloading device which regulates the

flow of current to the motor, thereby maintaining a practically constant vacuum under the varying load.

The hospitals at Portsmouth, N. H.; Narragansett Bay, R. I.; and Chelsea, Mass., are building under one contract for \$835,127 and are about 96 per cent completed.

The calculated normal bed capacity is 14 beds for officers and 120 beds for enlisted men in each hospital, making the average cost per bed of \$2,122. The estimated emergency capacity of the hospital is 184 patients.

At the present time construction of only the main hospital buildings has been authorized, due to the low state of the naval hospital fund, from which the expense of erection has been defrayed.

The hospital at Puget Sound, Wash., as noted below, is building under a congressional appropriation which has proved to be insufficient, necessitating certain departures from the typical plan.

THE NAVAL HOSPITAL, PUGET SOUND, WASH.

The naval station on Puget Sound was established in 1895. The first mention of the need of a hospital at this station occurs in the Surgeon General's report for the fiscal year 1896. A 4-roomed building near the center of the station was assigned to the Medical Department in 1898, but had only 2 beds for accident cases and no provisions for the continued treatment of cases in the building. In 1900 plans for a yard dispensary were made, to be built by and under an appropriation from the Bureau of Yards and Docks. Owing to an insufficient appropriation, only the pavilion ward was completed and opened for patients on May 1, 1903, and soon after it was transferred to the Bureau of Medicine and Surgery and designated as a naval hospital. The building was completed by the erection of a 2-story administration portion with 2 rooms for sick officers. The total bed capacity was 16. The rapid growth of the navy yard has necessitated better and more commodious accommodations for the care of the sick. In 1906 a site for the location of the new hospital was selected on a commanding situation about 300 feet above the sea level.

The naval acts of March 2, 1907, and May 13, 1908, appropriated \$75,000 each for the erection of a hospital. Owing to all the bids being in excess of the appropriation, it has been necessary to temporarily omit one ward wing. With the exception of the above and the omission of the solarium at the ends of the wards, the plan is essentially that of the "type" naval hospital.

A solarium has been introduced between the ward wing and the administration building and the hexagonal solarium omitted from the corridor between the administration and the subsistence-operating buildings.

In the basement of the administration building are the mortuary and autopsy rooms, darkroom, dispensary, medical storerooms, and, in the rear, the power plant. Beneath the ward are the steam laundry, disinfecting plant, bag and hammock room, showers and toilets, serving room, and a recreation room.

The first and second floors of the central part are practically the same as in the similar hospitals now building—offices on the first and sick officers on the second floors, for whom 7 bedrooms, a dining room, and two sitting rooms, and a diet kitchen are provided. The third floor when completed will have accommodations for 22 Hospital Corps men, 2 in a room.

In the subsistence-operating building the arrangement of the space in the basement and first floors is according to the "type" plan. On the second floor are two operating rooms, with independent preparation rooms, a surgeons' dressing room, sterilizing, anaesthetizing, and recovery rooms, and a general dressing room, and an X-ray and cystoscopic room.

The interior finish and equipment of this part will be thoroughly modern and aseptic. The front exposure of the hospital being toward the southeast, the operating room will have a northern orientation.

The two wards will have a normal capacity of 24 beds in each ward and 4 in the two quiet rooms. The cubic air space is 1,365 feet, and the floor area 105 square feet per patient. The utility rooms are located on either side of the entrance to the wards, the quiet rooms occupying a lateral extension of the ward on either side near its outer end.

The structural details are essentially the same as in the other hospitals of this class.

Contagious-disease buildings are under construction, to consist of an administration building and three wards. These buildings are identical with those being erected at the Great Lakes Hospital and both groups will be paid for from an allotment of \$10,000 from the naval hospital fund.

The completion of the remaining wing, the power plant, nurses' quarters, and the medical officers' quarters is dependent upon further appropriations.

The present capacity of the hospital is 56 beds for enlisted patients and 7 beds for officers. The cost per bed, \$2,570, of the present construction is high, due to the comparatively small number of beds in relation to the administration and surgical features. This hospital was occupied in January, 1912.

NAVAL HOSPITAL, GUAM, MARIANA ISLANDS.

When this station was occupied by the Navy the natives had been without medical attendance since the evacuation of the island by

the Spaniards. The sanitary condition of the island was bad, intestinal diseases were prevalent, syphilis endemic, and sporadic cases of leprosy were present.

A small building, formerly used for the same purpose by the Spaniards, was assigned as sick quarters, and equipment was brought out by the U. S. S. *Yosemite* in 1899. Later a larger building was assigned as sick quarters, which was sufficient to accommodate the sick of the naval contingent, but was not available for the reception of the natives.

In 1901 a movement was started to provide a hospital open to both sexes of the Chamorros. This institution is known as the Maria Schroeder Hospital, after the wife of Rear Admiral Schroeder, to whose efforts the erection of the building was largely due.

About 0.414 acre of land was obtained from various natives, and 1 800 pesos (\$900) were raised by subscription and a like sum was appropriated by the insular government for the purpose of building the hospital. The building is 2 stories in height, the lower of stone, the upper of wood, and accommodates 20 patients in 2 wards, and has an office, dispensary, and a room for the Hospital Corps men on duty. In 1906 a wing was added for an operating room and laboratory, and a kitchen and mess room were built on the rear.

Since 1902 the naval sick quarters have been located in this building, a rental of \$62 being paid therefor.

In 1905 the Susana Hospital Association was founded by subscriptions, the largest donation, \$10,000, being given by Mrs. Russell Sage. The association is named after the wife of the then governor general, Captain G. L. Dyer, United States Navy, who had been prominent in the organization of the society. The original building was rented from a native, and had a small ward (4 beds) and arrangements for an out-patient clinic. Subsequently this building and a small tract of land was purchased by the association. On December 10, 1909, this hospital was destroyed by an earthquake. Following this a portion of this hospital tract (about 0.672 acre) was transferred to the Federal Government as a reservation for a naval hospital, it being provided that the hospital be open to women and children.

The sum of \$6,000 was appropriated from the naval hospital fund to erect a naval hospital under the above conditions, and also \$4,500 from the insular leper and gangosa appropriation for the building of a ward for women and children suffering from the latter disease, which is now believed to be a peculiar manifestation of syphilis. Upon completion of the naval hospital the insular government has agreed to cede to the General Government the buildings and reservations of the Maria Schroeder Hospital. With this addition the naval hospital will consist of three 2-story pavilions, stone or

concrete to the second floor, frame above. The pavilions are in a line fronting the southwest and are connected by corridors and surrounded by a 10-foot veranda. In the rear of the Maria Schroeder Hospital are two annexes, containing the kitchen, mess rooms, operating room, and laboratory. It has been proposed to erect a more complete operating building in the rear of the naval hospital proper, and the construction of this building will soon be commenced, as materials have been shipped from the United States for this purpose. The Susana Hospital Association proposed to erect a maternity building at the northeast corner of the reservation.

The normal capacity of the combined hospitals is 100 beds, with the possibility in an emergency of an extension to 200 beds.

The reservation of which the Federal Government has complete control comprises 1.086 acres. In addition to the hospital service, the naval medical officers have complete sanitary supervision of the island and the instruction of the native women in the elementary principles of nursing.

Recent developments promise the eradication of gangosa by specific treatment, and of leprosy by isolation of the patients, in which case the special hospitals erected under an insular appropriation will be available for general diseases.

NAVAL HOSPITAL, YOKOHAMA, JAPAN.

This hospital was established in 1872, being located on a reservation obtained by concession from the Imperial Japanese Government. A small additional lot was purchased in 1907 for \$4,980, appropriated by naval act of June 29, 1906. The reservation now comprises about 1.6 acres.

The original buildings have from time to time been replaced by those of modern construction. During the Boxer outbreak in China in 1900 this hospital was overcrowded by the sick and injured from the expeditionary force. In consequence of this, \$20,000 was allotted from the emergency fund, Navy Department, for the erection of a new ward, which was built on the site of the old one. This building consists of a basement and two frame stories. In the former is a 90-horsepower boiler, which supplies low-pressure steam for the heating plant and steam sterilizers and runs the laundry. On the first floor are quarters for the hospital apprentices, a strong room, and three small wards (18 by 30 feet). On the second floor are located the operating room, X-ray outfit, an eye, ear, nose, and throat examining room, and three small wards.

In 1903 plans were made to replace the main administration building, which had become very much deteriorated. For this purpose a special appropriation of \$25,000 (naval act of Mar. 3, 1903) had

been made. This building was completed in 1909. It is two stories in height, on a basement, and framed to withstand earthquakes. The basement affords space for a general mess room and storerooms.

On the first floor are the executive offices, a reception room, dispensary, and quarters for a junior medical officer and a pharmacist. The second floor has accommodations for 9 sick officers. An outside steel-and-glass stairway is provided for use as a fire escape. A detached kitchen has been built, located midway between the main and the ward buildings.

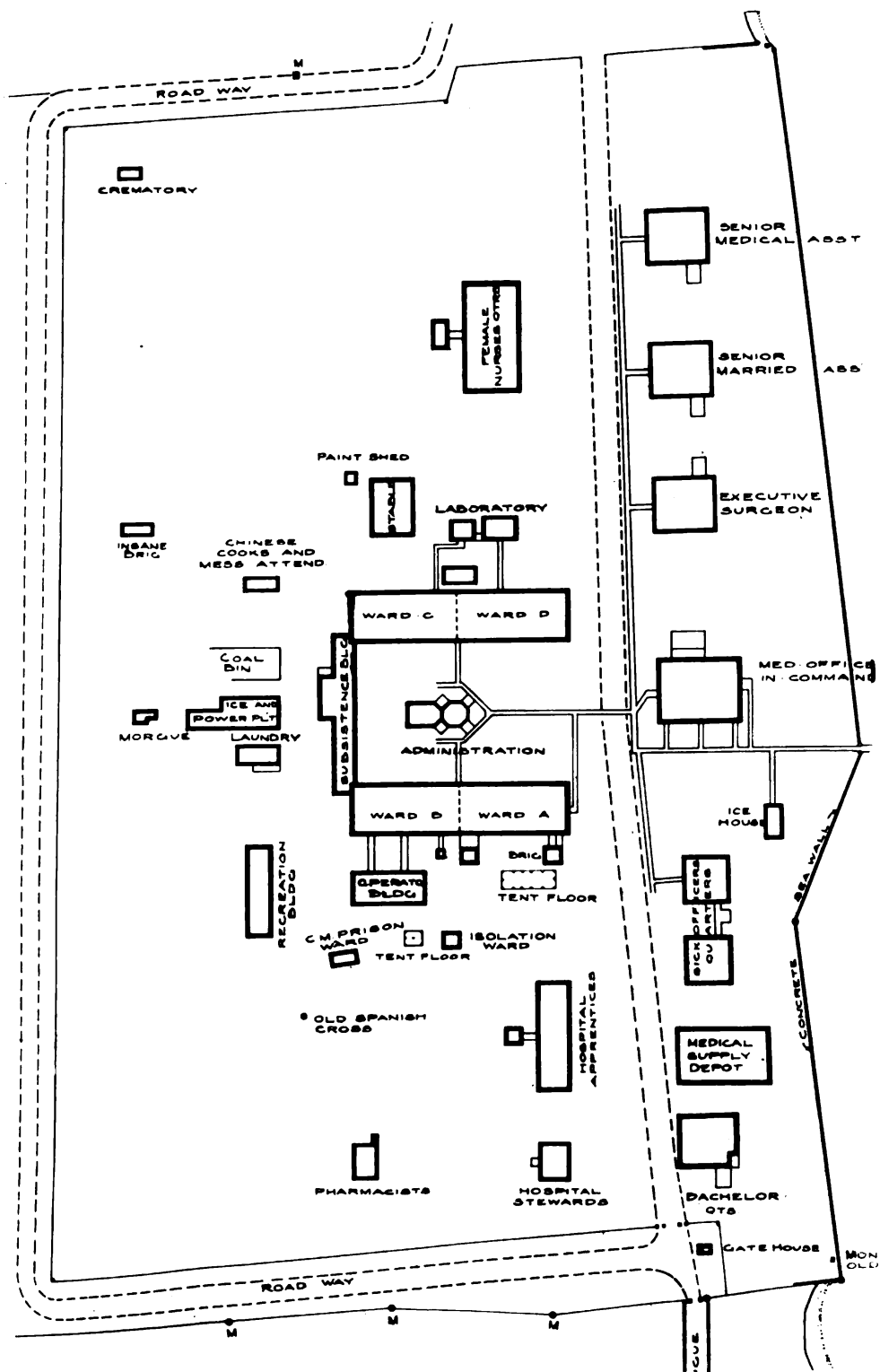
The medical officer in command occupies a small bungalow at the eastern corner of the grounds. The only provision for infectious cases is a small 2-bed building. The civil employees are quartered in a detached building. The hospital is lighted by electricity, piped for gas and water, all from the municipal plants.

The normal capacity is 80 beds in the wards, and rooms for 9 officers. In an emergency 100 patients could easily be accommodated.

The establishment of a naval hospital at Canacao, P. I., has diminished the importance of this hospital, which formerly was the only naval hospital in the Far East. It is, however, valuable as a sanatorium for those debilitated by the tropical climate of the Philippines, and is especially so as a base hospital, as was the case during the Boxer insurrection.

NAVAL HOSPITAL, CAÑACAO, P. I.

Soon after the acquisition of the Philippine Islands the presence of a large naval force on that station under unfavorable sanitary conditions made the necessity for a naval hospital acutely felt. In 1899 the Bureau of Medicine and Surgery sent out Medical Director R. C. Persons, United States Navy, with a staff of medical officers and Hospital Corps men and the necessary supplies for the establishment of a hospital, which was opened in March, 1899, in a portion of a storehouse on the water front of the naval station at Cavite. This arrangement was regarded as but temporary, the location being undesirable for the sick and the building unsuitable for the purpose. In 1902 Congress made an appropriation of \$50,000, to which \$70,000 was added (naval acts of July 1, 1902, and Apr. 27, 1904), for the construction of a hospital, which was occupied on March 14, 1905. Since that time, during the years 1909 and 1910, \$150,000 from the naval hospital fund has been expended in extending and improving this plant. A selection was made of a site at Cañacao, formerly used for a similar purpose by the Spanish. It is distant about 1 mile by water and 2 by land from the station, and is located on a narrow peninsula elevated but 3 to 7 feet above the sea level. Its situation, swept by the prevailing breezes, is the most salubrious of any on Manila Bay.



UNITED STATES NAVAL HOSPITAL RESERVATION, CAÑACAO, P. I.

The hospital faces a little south of east. A wharf extends east from the sea wall, behind the commanding officer's quarters, and the reservation extends 1,200 feet to the west of the road behind the hospital, and includes the cemetery and pesthouse.

With the exception of two buildings, one of which was formerly the chapel, all of the structures of the old Spanish hospital were destroyed during the Philippine insurrection. The reservation, consisting of 58.8 acres, was transferred to the Bureau of Medicine and Surgery December 19, 1901. The building of a retaining wall and a considerable fill have been required to insure a sufficient elevation above high water.

The plans were prepared in the Bureaus of Medicine and Surgery and Yards and Docks and are those of a block pavilion hospital, with the former Spanish chapel converted into an administration building as a nucleus.

The open court, in which is the administration building, faces the southeast, the opposite side being occupied by the subsistence building and the remaining sides by the two pavilion wards.

The commanding officer's, junior medical officers', and sick officers' quarters are located along the street crossing the southeast side of the hospital and face toward the bay. To the rear of the subsistence building are located the power house, cold-storage plant, and the morgue.

Connected with the rear or outer side of the southwest ward is the operating building and in a corresponding relation to the opposite ward is the laboratory, out-patient clinic rooms, and the animal house. The quarters for the nurse corps are to the eastward of the hospital across the street from and facing the officers' quarters. The dormitory for the hospital apprentices and two small bungalows for hospital stewards are situated in the southwestern part of the grounds. To the northwest, about 100 feet distant from the hospital, is the recreation building which is partly closed in and is provided with a library, pool tables, and other games. In the extreme northern part of the reservation is an infectious ward for 20 patients. This building is in an advanced state of deterioration and will soon be useless. The remaining structures worthy of note are the quarters for Chinese attendants, the laundry, stables, and garbage crematory. As a rule the buildings are of the low pavilion type, or bungalows, of modern construction, elevated on concrete columns, with corrugated iron roofs, and surrounded by broad verandas. The two wards and the subsistence building are connected by these verandas.

Each ward building consists of two pavilion wards of 40 beds each connected by a 2-story portion in which are located the rooms for nurses, the dispensary, storerooms, and dressing rooms, and quiet rooms. The lavatories and toilets are in concrete annexes in the rear of and connected by an open corridor with the ward.

The wards have free natural ventilation by means of numerous double-hinged windows, transoms, and a 9-inch space beneath the trusses on each side. They are screened throughout.

In the subsistence building are the messrooms for the convalescents and the Hospital Corps.

The operating pavilion, tiled throughout, has a well-appointed operating room, anesthetizing, recovery, sterilizing, and dressing room and 4 rooms for serious surgical cases.

The power plant consists of three 50-horsepower boilers which run 3 electric generators, the ice machine and compressor, distiller, and various pumps.

The morgue is artificially cooled by circulating brine from the ice plant.

This hospital has an excellent clinical laboratory, in connection with which is an animal house.

The quarters for members of the Nurse Corps have accommodations for 15 nurses, also rooms and an office for the head nurse, a kitchen, a dining room, and a recreation room. This building was completed in 1910 at a cost of \$16,000, drawn from the naval hospital fund.

The hospital apprentices' quarters have a capacity of 30 beds.

The quarters for the medical staff vary only slightly in size and arrangement of the rooms. They are well adapted to the climate, all rooms opening on a central hall and also on the veranda. The kitchen is in an annex.

The accommodation for sick officers consists of two small but very comfortable bungalows of 4 rooms each, with a kitchen and a mess room in common between the two houses.

For the care of patients who are general court-martial prisoners a "strong ward" is provided.

Within the same inclosure and under the same command as the hospital is the naval medical supply depot, located near the southwest gate. The depot consists of a single fireproof, concrete building of 2 stories, and is provided with every convenience for the handling and storage of medical and surgical supplies. Adjacent to it is a set of officers' quarters, both buildings having been erected under a special appropriation of \$25,000. (Naval act of Mar. 2, 1907.)

A wharf with a sufficient depth of water to permit the landing of large launches affords easy access by water to the hospital from ships and station.

Sewer, water, and electric mains have been extended to all parts of the grounds.

An artesian well furnishes a fairly ample supply of good water, but owing to the liability of contamination in the tank all water for internal use is distilled. For additional fire protection a salt-water system, with a special fire pump, has been installed. This system is connected with the mains from the 100,000-gallon reserve fresh-water tank, which may be utilized in the case of a breakdown of the fire pumps.

The cost of this institution, in addition to the original congressional appropriation of \$120,000, has been about \$166,000, all of which has been allotted from the naval hospital fund, making the total cost \$286,000, or the cost per bed about \$1,662.

The normal capacity of the hospital is 8 beds for officers, 160 for enlisted men, and 4 beds in the operating pavilion, a total of 172 beds. In an emergency, by using the broad verandas, which is practicable except in the typhoon season, and by utilizing the various detached buildings, the capacity can be extended to 350 beds.

This hospital is an example of the inadvisability of using wood in the construction of buildings of a permanent nature in the Tropics. It is not yet 10 years since this hospital was commenced and less than a year since it may be regarded as completed, and at this time the life of some of the main buildings is regarded as limited to six years, owing to the ravages of the white ant. While of somewhat greater initial cost, concrete is much preferable, being cooler and practically indestructible.

The recent decision designating the Naval Station, Olongapo, as the naval base in the Philippines and the establishment of the main base for the Pacific at Pearl Harbor, Hawaii, will undoubtedly decrease the importance of this hospital, but it is improbable that it will be abandoned. With a small 50-bed hospital at Olongapo to care for the acute cases from the local personnel and ships temporarily at the station, the Cañacao hospital will still be the main hospital for the station.

On account of the superior attractions for amusement, Manila Bay will most likely remain the rendezvous of the fleet for the purpose of granting liberty.

The four remaining naval hospitals are of minor importance, being located at inactive stations and where the indications point to either a discontinuance of the yard or station or to no further development.

NAVAL HOSPITAL, PORT ROYAL, S. C.

An appropriation of \$4,000 was made in the naval act of March 3, 1897, to construct a small hospital at this station, but no bid within this amount was received. During the Spanish-American War two Ducker portable hospitals were erected, but were destroyed by a hurricane in August, 1898. Subsequent to this two pavilions with a capacity for 10 patients were built and later an operating room and a kitchen annex have been added. The normal capacity is 13 beds.

NAVAL HOSPITAL, PENSACOLA, FLA.

This hospital remains practically as it was in 1875 with the exception of the inevitable deterioration incident to age. During the

last 20 years the Pensacola Navy Yard has been in an inactive state, visited only infrequently by training ships or by the fleet during target practice. As the present indications are that the naval base for the Caribbean will be established elsewhere it is unlikely that any extensive improvements will be made at this hospital. In 1907 a congressional appropriation of \$25,000 was made for the erection of a new hospital and officers' quarters at this yard, but no new work has been undertaken owing to the closure of the yard. Additional land in the vicinity of the hospital has been added to the reservation to provide for further development if required.

The capacity at present is given as 3 beds for sick officers and 32 for enlisted men.

NAVAL HOSPITAL, SITKA, ALASKA.

The building formerly designated, for administrative purposes, with this title was condemned as unsafe and was demolished in 1905. Since that date the former residence of the governor was used for dispensary purposes, but has been abandoned owing to the withdrawal of the marine guard in March, 1912.

NAVAL HOSPITAL, SAN JUAN, P. R.

Following the occupation of the island by the United States the hospital was for a time located at the naval station. In 1903 buildings formerly known as the "Army Corral" located on elevated ground outside of the city were turned over to the Navy for hospital purposes. Three small one-story buildings, a kitchen, a mess room, an operating room, and a detached lavatory were erected. In 1905 the hospital was increased by the transfer from the Bureau of Equipment of three small buildings formerly used as a wireless station. The present normal capacity is 30 beds. Consequent upon the closure of the Navy Yard at San Juan on June 10, 1911, this hospital was placed out of commission and transferred to the insular government.

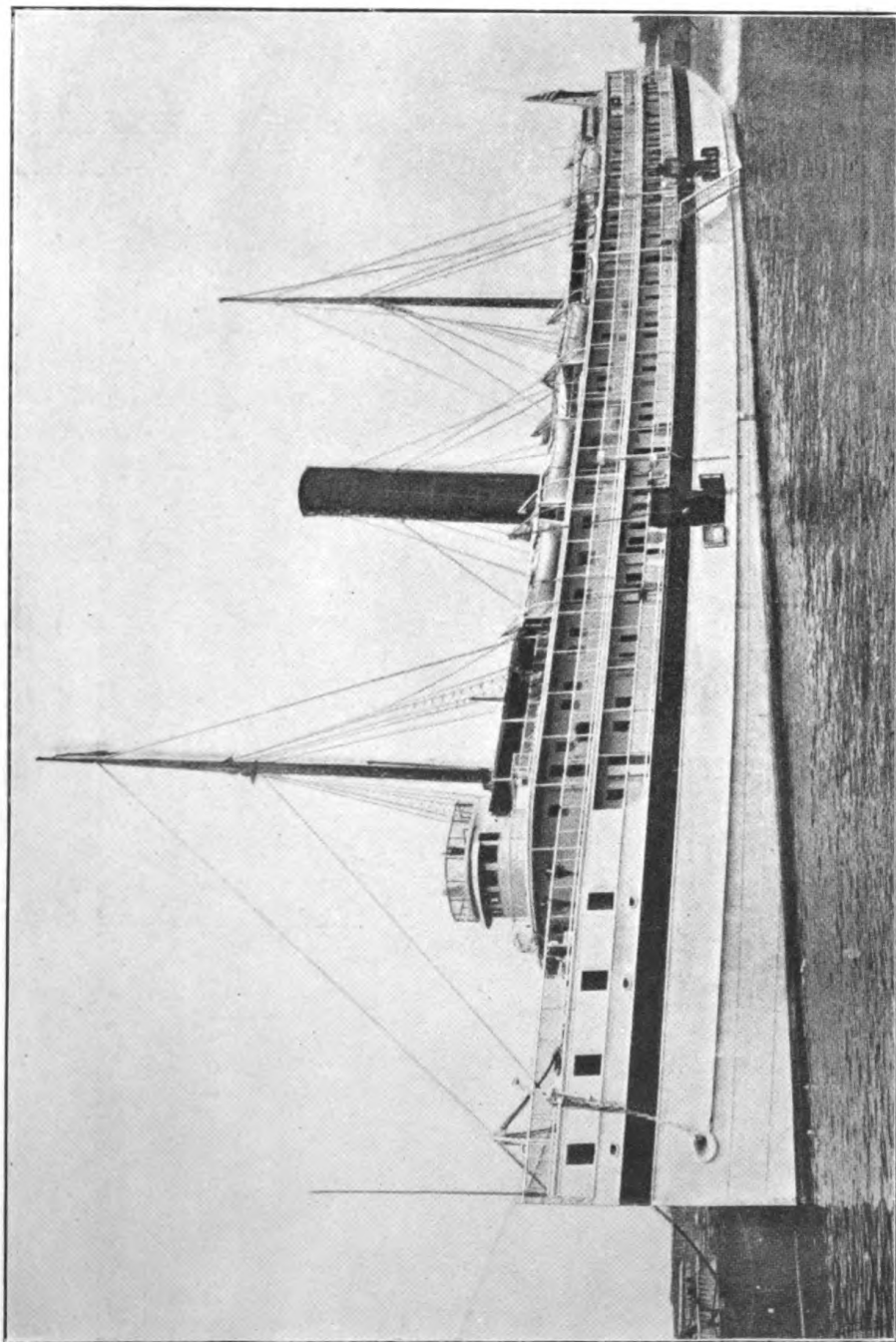
NAVAL HOSPITAL SHIPS.

A description of the naval hospitals is not complete without reference to the mobile hospitals of the service.

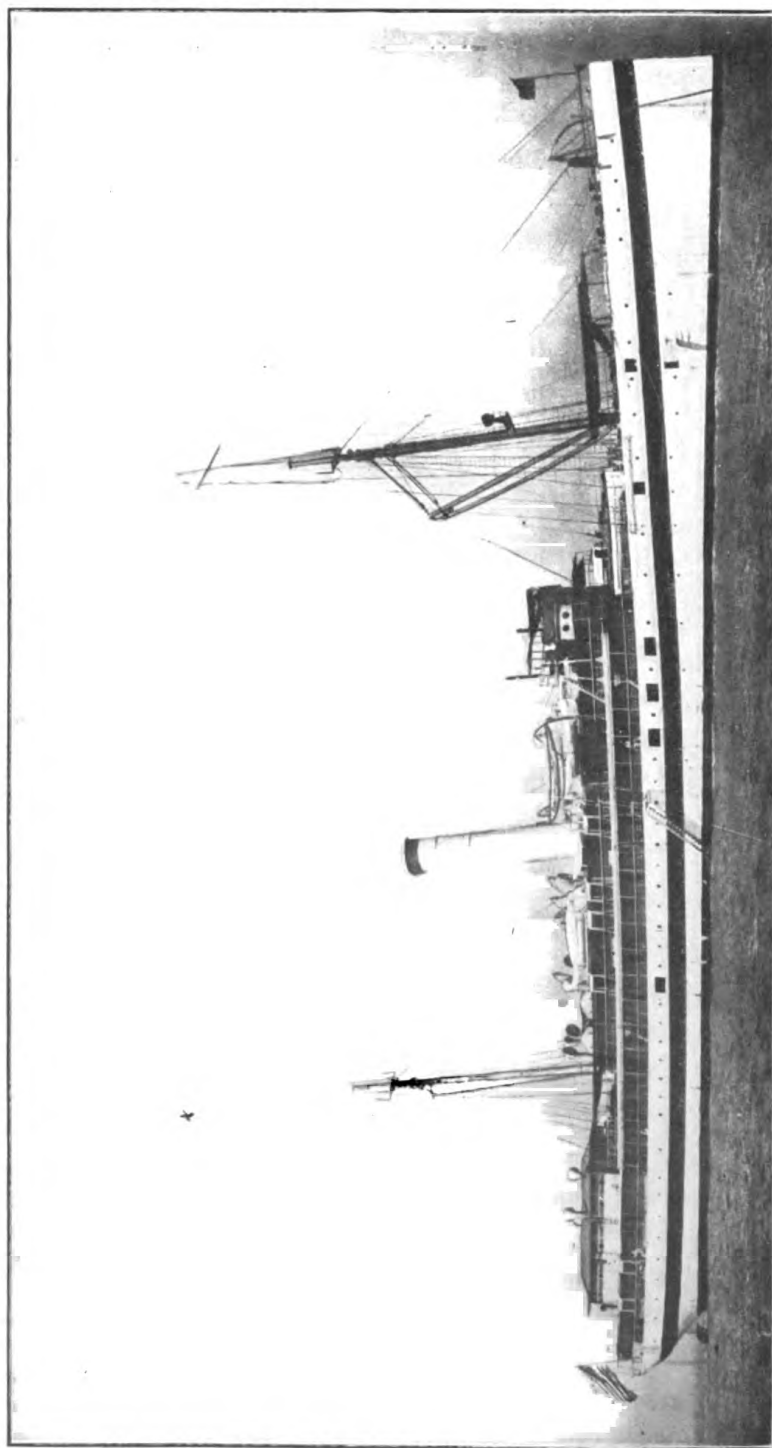
U. S. S. "RELIEF."—This hospital ship was formerly a coast-wise steamer running between New York and Boston in the passenger service. It is of 3,000 tons displacement, single screw, 2,226 horsepower. The hull is of steel, the deck house of light wooden construction.

During the Spanish-American War this vessel was purchased by the War Department and hastily converted into a hospital ship.

The *Relief* remained in service as such, being of a great service in Cuban and Philippine waters, until transferred to the Navy Depart-



U. S. NAVAL HOSPITAL SHIP RELIEF



U. S. NAVAL HOSPITAL SHIP SOLACE.

ment in 1904. In 1908, after extensive alterations in the hospital arrangements, the *Relief* was placed in service as a hospital ship under the command of a medical officer of the Navy with a civilian navigating and engineering complement. The *Relief* met the Atlantic Fleet at Magdalena Bay, Mexico, and accompanied these vessels as far as Manila, where she was condemned as unseaworthy on account of the frail upperworks. In November, 1908, she was ordered to join the Pacific Fleet in Chilean waters. While en route a typhoon was encountered off the coast of Luzon, P. I., and such injuries to the deck house and main engines were sustained as to necessitate a return to Manila. Subsequently this vessel was ordered to the naval station at Olongapo, P. I., to supply needed hospital accommodations and has there remained being no longer regarded as available as a cruising hospital ship.

The *Relief* has three wards with an aggregate capacity of 208 beds, including 30 cots in the light infectious ward. The surgical and medical equipment is complete and the presence of the ship with the fleet afforded the advantages of a well-equipped hospital at all times. A separate ward and rooms are provided for the sick officers. The isolation ward proved of great value in preventing the spread of epidemics on the battleships, while the presence of a dentist resulted in the saving of unnecessary suffering.

U. S. S. "SOLACE."—This ship, formerly the *Creole* of the Morgan Line, is of 5,700 tons displacement, single screw, and of 15 knots speed. The deck house, as well as the hull, is of steel. This vessel was purchased by the Navy Department early in the Spanish-American War, fitted up as a hospital ship, and rendered signal service after the naval engagement off Santiago, Cuba, July 3, 1898. Subsequent to the war she was used as a naval transport between San Francisco and the Philippines.

In November, 1909, after extensive overhauling and alterations she was placed in service as a hospital ship and assigned to duty with the Atlantic Fleet. The naval complement consists of the medical officer in command, 6 medical officers, a pharmacist, and 52 Hospital Corps men; the complement of the Naval Auxiliary Service comprises 11 officers and 71 men.

The quarters for the commanding officer, the sailing master, and the watch officers are on the hurricane deck, forward. Aft on this deck are three isolation wards with a total capacity of 30 patients. On the upper deck from forward aft is the operating room with two operating tables, the eye, ear, nose, and throat examining room, the laboratory, dental laboratory, medical officers' mess room, galleys, auxiliary officers' mess rooms, officers' staterooms, office of the medical officer of the day, rooms for 9 officer patients, the convalescents'

mess room, and a lavatory for the Hospital Corps. On the main deck, forward, are the two main wards with double tiers of bunks, accommodating 68 patients in the medical and 76 in the surgical ward. The remaining portion of this deck is assigned to the berthing and messing of the engineer's force, the mess attendants, and the Hospital Corps men. On the lower deck, forward, are the seamen's quarters; the storerooms and machinery occupying the remaining space.

In the extreme after end is the morgue, which is cooled by circulating brine from the ice plant. There has recently been installed a diet kitchen provided with electric appliances for cooking. It is unnecessary to itemize the equipment of the hospital, which is thoroughly modern in all respects.

A wireless outfit is of great use for communication with the fleet at a distance.

The methods of handling patients has been worked out, the Stokes splint stretcher being generally used. Extension cranes with trolleys and automatic locking hooks have been adopted for transferring patients from boats to the upper deck. An elevator provides for easy transit from the wards to the operating room and upper deck. The *Solace* has had the reputation of rolling excessively during former commissionings, but it is now reported as being quite stable, due to a change in the amount of ballast and the addition of bilge keels.

GENERAL REMARKS.

NAVAL MEDICAL SUPPLY DEPOTS.—These are located at the naval station at New York, Mare Island, Cal., and Cañacao, P. I. The one at New York is the principal purchasing depot, but at all a large reserve supply of medical and surgical stores is maintained.

MEDICAL CORPS OF THE NAVY.—As authorized at present this corps consists of 15 medical directors, 15 medical inspectors, 85 surgeons, and 230 in the junior grades. The medical staffs of the hospitals are not permanent, being changed as officers become due for sea or other duty. They are, as a rule, commanded by medical directors, medical inspectors, or surgeons. The next in rank is the executive surgeon under whom comes the details of administration, care of property, and the treatment of the patients; duties corresponding in a measure to those of the assistant superintendent or the resident physician of the civil hospital. A junior officer for each 50 beds and frequently one additional for laboratory work and a pharmacist, who acts as commissary officer or general purveyor, complete the staff. The executive or some officer selected by reason of his surgical experience is regarded as the operating surgeon, but it is not contemplated that all operations be performed by him, to the exclusion of his juniors. In addition to the strictly professional duties of the

hospital are the various military reports and returns and the individual records of the patients. This last is a continuous succinct health record carried on as long as the man is in the service and is valuable for both pension and statistical purposes. Each ward officer is responsible for the condition of his wards, the discipline of the attendants and the patients, and the treatment of the latter. The junior officers alternate as officer of the day, upon whom rests the carrying out of routine, the general orderliness of the building, the receipt and discharge of patients, and, in the temporary absence of any ward officer, the professional care of his patients.

The nursing in our hospitals was, up to 1898, performed by civilian, male employees, and on board ship by men detailed from the deck. While there were those who did devoted and conscientious service yet the conditions in this respect reminds one greatly of those existing in civil life 50 years ago to which Mr. Joseph H. Choate referred in a recent address in honor of the late Florence Nightingale as follows:

It seems most incredible to most people that 50 years ago, and less, we were still in the primitive stage of the development of medicine when any corner loafer was considered good enough to be made a nurse.

At present the nursing afloat is well done by the Hospital Corps, a selected and trained body of men. At the hospital their services are supplemented by those of the Navy Nurse Corps which was organized in 1908 and is composed of graduates of well-known training schools. They have added to the hospital administration the needed gentle touch to which few men, no matter how well trained, can approach, and only a woman attain.

Funds for the erection of naval hospitals come either from specific appropriations by Congress or an allotment from the naval hospital fund. Their maintenance is from the latter, except the salaries of the civil employees, which are defrayed from the annual Medical Department appropriation.

NAVAL HOSPITAL FUND.—This fund was established by Congress in 1798 by levying a tax of 20 cents per month on all seamen. It has been added to by the sale of portions of hospital reservations and acts of Congress from year to year. The continuous sources of revenue are at present the 20 cents per capita tax on the salaries of all persons in the Navy, the ration allowance of 30 cents per diem for each patient, the pensions due patients while in hospital or in the Naval Home, all fines imposed by courts-martial and all salaries due deserters. The amounts received from these various sources has in recent years been sufficient, but with the larger and more expensive institutions now building it may be necessary to have recourse to an annual appropriation from Congress to meet a deficiency.

MAINTENANCE OF HOSPITALS.—The total cost of maintenance of the hospitals during the year 1910 was \$631,778, which is exclusive of all

salaries. The average cost per day for maintenance was \$1.030 plus, for subsistence alone \$0.639 plus.

With the exception of the naval hospitals at Washington, Annapolis, and Great Lakes, where civil architects were employed, the designing of the plans and the inspection of the work for new construction and reconstruction has been done by the Bureau of Yards and Docks, based upon the general plans recommended by the Bureau of Medicine and Surgery.

In this connection it is desired to express the appreciation of the writer to the Bureau of Yards and Docks and especially to Mr. F. W. Southworth for many details of construction supplied in this description.

SUMMARY.

In the aggregate the naval hospitals and hospital ships now in commission afford accommodation for 2,584 patients, estimated upon the ordinary capacity. With the completion of those now building, the total emergency capacity of the naval hospitals may be stated to be 3,500 beds. This provision exceeds by far the normal requirements of the service under ordinary conditions, but it must be considered that the Medical Department of the Navy, as well as other branches of the service must be prepared for the exigencies of war.

Owing to the distribution of these hospitals over half the earth's surface and the modern tendency of the concentration of the naval force in one or two large fleets operating from a base, it is probable that the evacuation of the wounded would be into one to five of these hospitals.

The theater of operations in warfare may be for this purpose divided into five regions, viz: (1) The Atlantic coast; (2) the Caribbean; (3) the western approach to the Panama Canal; (4) the mid-Pacific (Hawaiian Islands); (5) Philippine waters.

On the Atlantic coast, north of Cape Hatteras, there will soon be five hospitals with a capacity of about 1,350 beds, among which the injured could be distributed by the ambulance ships, circumstances permitting.

South of the Carolinas and in the West Indian waters the Navy has no hospital accommodations worthy of note and no civil establishments are available. It would therefore be necessary to transport the wounded a long distance, to their possible detriment, and also would for a prolonged period divert the hospital and ambulance ships from attendance upon the fleet at a time when their services might be urgently needed. A fleet operating from the Isthmus in either ocean would have available the Colon and Ancon Hospitals, provided they are maintained after work on the canal is discontinued.

At Pearl Harbor, Hawaiian Islands, the construction of a 260-bed hospital has been authorized by Congress. This hospital is to be constructed of concrete and so designed as to be expanded into accommodations for 1,000 patients. These tentative plans for the initial construction have a general arrangement similar to the "type" hospital with certain modifications for a tropical climate. The ward unit is subdivided into two parts by the quiet and service rooms which are located in the center of the wing. The lavatories and water-closets are in separate buildings in the rear of the wards. As the construction will be simple without the necessity of providing artificial heat or ventilation, it is expected that the cost of construction will be within \$1,200 per bed.

For operations adjacent to the Philippine Islands the Cañacao Hospital with the former hospital ship *Relief* at Olongapo would, with other buildings available, probably be ample. It is therefore apparent that the hospital construction most urgently needed is at the prospective naval base at Guantanamo, Cuba, and at Pearl Harbor, Hawaii, where there should be at least a thousand beds available.

With the hospitals completed, building and projected, the Navy will possess probably the greatest number of beds under one organization in the United States. At the present time the Bureau of Medicine and Surgery is unifying the management of these institutions with a view to economy and efficiency and also so that an officer familiar with the routine in one is familiar with all. While medical officers are required to keep posted in all the duties peculiar to their position, yet those having special qualifications are encouraged to develop specialities, with the result that to-day the principal hospitals have officers qualified to carry out the most recent practices in diagnosis and treatment.

A FEW GENERAL PRINCIPLES OF HOSPITAL CONSTRUCTION.

By F. W. SOUTHWORTH, S. B., architect.¹

Modern hospital construction demands that certain features be provided for the successful treatment of patients, but these requirements necessarily have to be modified to suit the circumstances attending each particular building operation. Broadly speaking, two main divisions are considered in the design of hospital buildings—administration and construction. The administrative requirements call for the central location of executive features and the convenient placing of utility rooms and supplies. The construction must provide for ample natural and artificial light, for ventilation, and for heat. Details of construction and fixtures call for designs along the lines

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of simplicity in order to make the hospital absolutely sanitary and to guard against the spirit of investigation and misuse that so often prevails among the momentarily idle in large institutions.

In the construction of hospital buildings the orientation naturally comes first, the position of wards and operating rooms being of the most importance. Wards should have at least two outside walls with windows, one side preferably to the south, a northeast and southwest axis being considered especially good. North light is always chosen for operating rooms where possible, the southern exposure being obviously the worst. Solaria, for wards, are of great service, but their position should be such that the direct southern light is not cut off from the wards. Where natural ventilation is to be depended upon principally, wards should have outside windows on three sides. In general, about 100 square feet of floor space and 1,200 cubic feet of ward space are sufficient for each patient.

Offices for the commanding and executive officers and for the surgeons are most advantageously placed along the front of the main or administration building, on the first floor, near the first story wards and the elevators, these providing easy supervision over the main hospital life. Laboratories, rooms for the examination of patients, for eye, ear, and throat treatment, and for dispensary work should all be centrally located to avoid confusion in action and unnecessary waiting. An ambulance entrance, separate from main entrance and near the elevator, will best answer the requirements in handling patients of this class. All supply and kitchen service should be arranged separately and be distinct from hospital, patient, and dispensary service.

The convenient placing of toilets, utility and cleaning-gear rooms, and diet kitchens minimizes the work of caring for patients and of keeping hospital rooms and wards in clean and wholesome condition. Provision should be made for the removal of soiled linen either by chutes or by galvanized-iron barrels. In both cases the linen should be put first into bags of dry canvas. Chutes have the disadvantage of usually giving rise to a strong up draft, which blows dust and particles back into the room.

Several details of construction have been used in the building of recent naval hospitals that are considered especially good and practicable. Coved cast-iron bases and plinths, 6 inches high, with a cove of 2 inches at base, flush with floors, have been installed throughout the buildings except in the main hall, administration building, and rooms with tile floors, where wood base and tile base have been substituted, respectively. The cast-iron base is secured to the wall by means of clips and is grouted and filled in with cement behind the metal so that the base becomes practically integral with the wall, the plaster finish being brought down flush with the base. Closet floors

are raised 6 inches above room or corridor floors in order that the cast-iron base may run across their front, doing away with cracks and corners at the floor level. This construction also makes it easier to clean and sweep out the closets. Simple window trim, without molds, has been used, and the section of muntins, rails, and stiles for sashes are without fillets. The feather edge that is unavoidable in the use of curved section and the omission of the fillets is taken care of by putty and varnish. In the actual work the feather edges have come out well and are not impracticable, although the section adds to the expense of the work and is not liked by the carpenters and joiners.

Except in a few instances in the main halls of administration buildings, where a little ornamentation might be acceptable, and in basements and operating suites, flush-surface wood doors are recommended throughout. The best wood doors are a compound, veneered type with birch exposed veneer. The finish should be varnish, leaving the natural coloring of the wood visible. White-painted trim is recommended only in operating suites and in toilets and dressing rooms. Basement doors may be a stock, paneled pattern, but those for operating suites and inclosing toilets should be metal, enameled white, with simple molds. Undoubtedly metal doors with surfaces as flush as possible are the best for all purposes, as they add to the fireproof properties of any structure and stand hard usage, but in most cases the expense involved prevents their use throughout hospital buildings.

The ideal hospital floor would be one of composition similar to Carbolith, Ashestolith, Kompolite, or Puritan, but up to the present time composition floors have not proven entirely satisfactory when laid in large areas. There are still a few practical points to be overcome, such as, for instance, cracking, roughness, and unevenness of surface, separating from the material on which they are placed, and discoloration. This type of flooring, in addition to other advantages, lends itself well to the formation of the cove base, as the material may readily be run up 6 inches on the walls. This has been done, but has not been successful enough to warrant the chance of ruining large amounts of work. Dr. Mann, of the Homeopathic Hospital in Boston, has used Puritan flooring in a few dining rooms and diet kitchens. That in the dining rooms was apparently satisfactory, but it was not a success in the diet kitchens, one in particular having to be relaid several times, as the constant moisture and dripping of water seemed to disintegrate the material. The best floor for wards and patients' rooms is linoleum cemented to a concrete base, as it is easy to walk on, quiet, and clean. This construction has been used very successfully abroad, labor conditions being different from those existing in this country, where it is extremely difficult and at times almost impossible to get men who are careful enough to install

any work of this description. To be successful the linoleum should be properly stretched on a cement bed and turned up 6 inches, approximately, on the walls, cut as required, carefully and neatly, with the edges at the top of the base caught in under brass strips which are secured to the walls. Plaster can be brought down on top of the brass strips flush with the linoleum base. Terrazzo has received a great deal of attention and has many enthusiastic supporters for flooring use, but this is another material that has been more successfully used abroad, especially in German hospitals, than in the United States. In addition to the cracking to which most terrazzo is subject, it is hard to walk on and is noisy. The Rockefeller Institute in New York has a ward floored with a circular ceramic, yellowish-buff tile. This covering looks attractive at first, but the amount of cement mortar in proportion to the tile is large and will probably wear readily besides being easily eaten out by acids. Further, the small tiles will break and chip. One advantage, of course, of the terrazzo or tile floor is that, if required, they can be thoroughly flushed without injury. A compressed cement tile about 6 inches square has been used in certain hospital work for ward floors, and so far they have given satisfaction, but they are more expensive than wood, have cracked and crazed, and have the disadvantage of wearing off in a fine dust unless they are constantly cared for, a condition that has been experienced at the Jefferson Hospital in Philadelphia, where concrete floors have been used. After investigating the question of floors very carefully, it appears that hard pine quarter-sawn flooring, heart stuff, is the best at present available for the majority of rooms. Such a floor, after several waxings, becomes practically impervious, and any small cracks are filled with wax.

For kitchens, bathrooms, diet kitchens, and toilets, an hexagonal, 3-inch, vitreous white tile is satisfactory. The vitreous tiles are practically impervious and when laid properly and evenly with a white cement joint are not only attractive but suitable. Their chief disadvantage is that they need frequent cleaning unless properly rubbed down and smoothed when laid. While vitreous tiles are often used in flooring operating rooms, the number of joints is excessive in proportion to the floor area, but they are particularly satisfactory for spaces tributary to operating rooms and for toilets, baths, and all similar rooms where expense prohibits the use of Tennessee marble. Tennessee marble, in tiles 8 inches by 12 inches, makes a thoroughly serviceable and satisfactory operating-room floor, as it is practically impervious and very slow in action under acids. Glass floor tiles have been tried in several hospitals, but the glass chips and spalls easily with any settlement or hard usage. White marble has been used in a number of civil hospital operating rooms, but it is easily acted upon by acids and soon shows wear.

For plastering, the best results are obtained by the use of prepared hard plasters, like King's Windsor cement plaster, Ivory plaster, Keene's cement, etc. Coved interior angles and "bull nosed" exterior angles are run in the plaster to allow of easy dusting and cleaning. Plaster should not be finished on or against woodwork without some mold or trim to cover the joint, as the shrinkage of the materials is bound to leave a crevice or crack.

Hardware throughout hospital buildings ought to be of a substantial, heavy type, free from ornamentation. "Solid cast polished bronze, natural finish" is one of the best. It is of a composition similar to that used for exposed plumbing, piping, and fittings, and will stand constant polishing without changing color or texture, although polishing is not necessary. Window sashes in wards and in rooms occupied by patients are often fastened by means of clinch fasts instead of the ordinary sash fasts on the meeting rails. The clinch fast is a set of two clamps operating by a thumb bolt about midway vertically of the window, which allows the two sashes to be clamped together at any required height. The clamp prevents shaking of the sashes in wind, locks the window so that it can not be opened from the outside, and prevents the quick raising of the sash from within. All doors in operating suites can be furnished with dust-proof roses, dust-proof strikes, and keyhole traps. The traps consist of flaps on springs which keep the keyhole closed flush with the surface unless a key is in the lock. The same idea is applied to the strikes, which are flush with the door jambs when the door is open.

Heating and ventilating is one of the most difficult subjects connected with hospital construction, and each hospital will have its own problems. For all work, however, fresh air must be supplied in abundance, quick and efficient ventilation must be provided, and the heating system *must be* a heating system. Theoretically, the schemes of indirect heating and indirect ventilation which have been so carefully worked out should produce the desired results, but the many failures of elaborate systems tend to make the simple methods the acceptable ones. Any method should allow easy change to suit the needs of the patients in question.

Conditions in winter are more trying than in summer, but experience shows that natural ventilation of wards, where possible, is the most satisfactory method. For artificial ventilation a combination of both the direct and indirect systems of heating and ventilating seems to be the most acceptable in the long run. The indirect method should be used for all toilets, diet kitchens, utility rooms, laboratories, and operating suites. Wards are best heated by the direct method with an auxiliary indirect heating and ventilating system for use when occasion demands. Mechanically cleaned air is not neces-

sary in most instances, except in operating rooms. Hot-water heat for direct systems is preferable.

Radiators are manufactured in a hospital pattern, free from ornamentation, and having sections about $3\frac{1}{2}$ inches on centers. They should be set out free from the walls to render cleaning easy, and if they are used in operating, bath, or any room where the floors are to be frequently washed they should be set up on platforms 2 to 6 inches above the main floor. This permits of flushing without danger of water following down the pipes to the rooms below.

Hospital plumbing needs especial attention, and only the best in layout, roughing-in, and fixtures can be economically used. In 1910 the United States Treasury, War, and Navy Departments chose representatives to design and decide upon the simplest and best fixtures for Government use, and a reference to decisions of this board, under "Specifications for plumbing fixtures," shows what should be required. The board specified both styles and weights, and manufacturers are producing these articles in accordance with the Government designs.

In most cases the fixtures mentioned as follows will prove the best for hospital use: For urinals, vitreous bowls with high enameled iron tanks and stayed chain pulls; for water-closets, vitreous bowls, wood seats, and low down vitreous tanks. In special cases bowls with integral vitreous seats are needed. Tanks should be large, to hold enough water to insure quick and efficient flushing of bowls. The water-closet tanks are covered with simple porcelain lids, which are bolted or fastened in place so that they can not be lifted without the use of proper tools and time. This obviates the probability of the tank lid being raised by anyone other than the plumber. The lever arm for flushing the bowl is simple and of such design that it can be readily repaired if injured. Bath tubs for private use and for patients who are convalescent and well enough to take their own baths are most satisfactory when of the corner pattern, so that only two sides of the tub are exposed and so that there is no chance for the accumulation of dust, dirt, and moisture back of the tub. Where tubs are installed in the general baths of the wards, and where the baths of the patients must be given by the nurses, the tubs should be placed so that a nurse can be stationed on either side. Lavatories and sinks for use in operating suites need rose sprays, deep bowls, and knee control. Pedal or foot controls are not sanitary or entirely satisfactory. Vitreous ware is used in all fixtures where the size will permit. "Red metal" is recommended for fittings for all plumbing fixtures, including standards for water-closet and bath inclosures. It is a composition of copper and tin, containing approximately 70 per cent of copper, and will stand indefinite polishing without change of color. Nickel plating looks very well when

it is properly cared for and only wiped off as required, but the tendency in most institutions is to polish the metal, and the nickel plating soon wears off, exposing in places the discolored brass or copper on which the plating is made. Shower baths are provided of simple design and of such construction that the mixing of hot and cold water is easy and so that scalding is possible only through deliberate attempt.

Simple fixtures are easily chosen for lighting, with canopies for wall brackets designed to bring the gooseneck as near the walls as possible. Holophane globes, extensive or intensive as the case requires, throw the light where it is most necessary. The placing of lights in operating rooms should be such that shadows will not be cast upon the operating table, and fixtures should be free from dust ledges. A satisfactory disposition of lights is in the form of a diamond. Five lights, incased in spherical shades, are used, one at each point and one in the center, with a switch for each light. Too much light, with the attendant sharp shadows, is often as annoying as too little light. In general, the height of operating-room lights from floor level can be assumed to be 8 feet. Indirect lighting for operating rooms has been considered, but it is not feasible without a great deal of expense. Wall-bracket outlets should be placed so that there will be ample head room underneath the bracket, 6 feet 6 inches to 7 feet being a good height, depending upon the style of fixture used. Ceiling lights in general are well placed 9 feet above floors.

VENTILATION OF WAR VESSELS.

The ship designer's point of view on ventilation.

By Naval Constructor R. H. ROBINSON, United States Navy.

The ventilation of war ships may be considered from two points of view:

- (a) The doctor's, looking toward ideal conditions.
- (b) The designer's, endeavoring to obtain as much as practicable without undue interference with other and necessary features.

The doctor's investigation is generally applied to completed installation and takes account of all aspects—the proportion of CO₂, foul air, temperature, humidity, etc. Criticisms are often based on unusual or the worst possible conditions, which may actually be of infrequent occurrence.

From the designer's standpoint each new design generally presents a new set of ventilation conditions, the effect of which at the best can be estimated and provided for in advance only as calculations and accumulated previous experience may guide.

In any ship certain limiting conditions obtain; in a war ship these limitations are doubly stringent. For example, below water-tight decks piping must not pierce water-tight bulkheads, as these are vital to the safety of ships. It is undesirable to pierce armor or splinter bulkheads in any portion of a vessel, as the continuity of these is necessary for the maintenance of its military efficiency.

Holes in the protective deck for the same reason should be minimized.

Weight must be kept down in the ventilating system as in all other systems, so as not to unduly rob the military features.

The encroachment on living space and head room must be as little as possible.

The location of the source of supply of fresh air must take into consideration battle as well as cruising conditions.

The electric power taken to run the blowers must be the least possible amount in order not to increase the generator capacity or to too greatly enlarge the coal consumption.

In a design each space is preassigned to a definite use, and the requirements as regards air supply are then considered. Such pre-assigned use is not always lasting. Compartments naturally group themselves into several classes. Those that are supplied with ample ports and hatches, so that any artificial form of ventilation is not normally required, i. e., spaces similar to those in the average house on shore; those not subject to abnormally high temperatures so that provision of opportunity for natural circulation is sufficient; and those whose location or use are such as to subject them to abnormally high temperatures, and requires them to have forced supply or exhaust, or both.

The ventilation of ships, as an important part of the work thereon, is of comparatively recent origin. The earliest ships were in the form of open boats and suffered rather from too much ventilation than too little. The first step toward complication was the addition of one deck, the space below being used for storing materials, and so requiring no artificial ventilation.

Subsequent developments during the era of sailing ships led to the addition of successive decks, but most of the living and working spaces were above the water line. There were few divisional bulkheads in these spaces and frequent gun ports or air ports. There were no artificial sources of heat within the ship itself, and the old method of hoisting a wind sail to ventilate holds or lower deck spaces sufficed.

Further, the personnel of the old sailing ship were mostly employed in the open air for a great part of the time and not, as are some of the personnel to-day, practically immured within the ship from one week's end to another.

Beginning with the era of steamships and more definitely with those of iron and steel, ventilation has become an important feature of all vessels other than cargo ships. The use of iron and steel in shipbuilding permitted the enormous increase in size which we have seen and entails compartmenting, both of which facts accentuate the necessity for ventilation.

With the increase in size and the numerous subdivisions of the vessel the difficulties of obtaining proper ventilation have increased very rapidly. The water-tight subdivision of the vessel is of major importance in any naval vessel, and this subdivision can not be maintained with numerous ventilation ducts leading through water-tight bulkheads and decks. In all ventilation work below the water line it is therefore necessary to limit the size and number of pipes to a minimum and to so lead these pipes as not to cut water-tight members. If such cutting is unavoidable, valves must be provided to insure water-tightness when needed. With such restrictions on the ventilation system it is natural that there will not be a superabundance of fresh air below decks.

Fortunately, however, the large and specially heated spaces, like engine rooms, dynamo rooms, etc., are less subject to such limitations than other parts of the ship, and for those spaces the design of the ventilation system reduces itself to a problem of providing sufficient pure air for the men stationed there and of reducing the temperature of the compartments to livable conditions.

The method of propulsion by power introduces artificial sources of heat and causes dissemination of heat within the structure of the ship by radiation, conduction, and convection, and these conditions must be provided for.

This heat is commonly known as wild heat and its amount is at best only approximately known. The wild heat liberated in any compartment can be predicted only in a comparative way, and even with two vessels of similar design the results will not be exactly alike. With different methods of insulation and lagging, and the different arrangement of compartments adjoining a live source of heat, the results will be very different. The method of insulating used on all naval vessels until recently was by ventilated air casings. It has been found that this method, while satisfactory when rapid changes of air can be obtained, often gave unsatisfactory results owing to the numerous small branches required to distribute the air to the various pockets between beams and stiffeners, and to the fact that these branches must of necessity traverse heated compartments before reaching the air casings. This makes it impracticable to obtain the necessary changes of cool air, and in consequence some of the air casings were at as high a temperature as the compartment containing the source of heat.

It has therefore appeared desirable to provide other insulating material and to distribute it so as to prevent the transmission of heat by conduction, as without doubt this method of heat transmission has not received heretofore the attention that it deserved. Exhaustive experiments have been conducted and a satisfactory solution is believed to be in sight.

Artificial ventilation is divided into two general classes: (1) Plenum, where fresh air is forced in and allowed to exhaust naturally; (2) exhaust, where bad air is drawn out and fresh air is allowed to enter naturally. The plenum system generally requires some special outlets for the exit of air and the exhaust system some special inlets for the entrance of fresh air, though in both cases natural outlets and inlets are utilized as far as applicable.

The exhaust system by itself, after years of trial, has been generally abandoned in the Navy, except for spaces such as water-closets, etherizing spaces, etc., where bad odors must be taken out. Recently specially heated spaces, like turbine machinery rooms closed down under a protective deck, dynamo rooms, and evaporator rooms, have had air forced in mechanically and exhausted mechanically also, thus making a combination of the two systems mentioned above.

Even the plenum system, satisfactory as it is in most cases, sometimes fails when natural openings alone are utilized for the escape of air. In a series of compartments all connected by means of doors or hatches, ventilated with the plenum system, the air from one space, if depended on to find its way to the outside, will have a considerable effect on the compartments adjoining, through which it must pass on its way out. To avoid this and to produce the best results it is necessary to provide an independent natural exhaust from each compartment fitted with artificial ventilation. On a naval vessel this might require considerable piercing of water-tight decks and bulkheads, and the practice must be strictly limited.

Forced ventilation systems have undergone many changes in their methods of mechanical accomplishment. The first were operated by steam-driven fans centrally located, supplying long systems, the pipes of which ran fore and aft and up and down, often pierced water-tight members, and depended on complicated valves to maintain the water-tightness of the structure.

Following these were similar systems supplied by electrically driven fans. Both these types will still be found in some of our older ships. Usually a ship had from 6 to 8 such systems, with, say, 2 fans forward, 2 or 4 amidships, and 2 aft. It came to be realized, as a result of experience, that these long leads of pipe, with their complicated valves, were undesirable and that the valves were frequently undependable. From this fact arose the present method of multiple, independent, electrically operated systems.

In modern ships no system pierces a transverse water-tight member unless well above the water line. The piping is made water-tight to a considerable height above the water line, so that if one compartment is flooded the ventilation pipe will not furnish a conductor for the water to an adjoining compartment.

A modern warship of large size will have from 40 to 50 such systems, each independent of the other in all respects.

The design of blowers and piping has been made the subject of careful tests at the Washington Navy Yard, and specifications for fans and for pipe design are now issued which practically insure the attainment of desired results in the system if properly carried out. The design of blowers involves questions of pressure, velocity, and efficiency that are rather more complicated than in most machines. Piping design includes questions of shape, size, finish, angle of bends, all of major importance, and all, until our experiments were conducted, little understood.

The question of measuring the air delivery has also received particular care, so that not only can the results be obtained, but also the inspector may be sure that they have been obtained. The apparatus used for this was developed by Naval Constructor D. W. Taylor, United States Navy, who also conducted the fan experiments referred to above.

The rates of change of air in various compartments are established with reference to the use to which the compartment is to be put.

The most important things to which attention must be paid in establishing such rates are:

- (a) The number of human occupants and their occupation.
- (b) The character and extent of artificial sources of heat within or adjacent to the compartment.

From the number of human occupants of a space the necessary amount of fresh air for human comfort can be approximately calculated. This calculation would be based on the amount of CO_2 exhaled by the occupants, and would aim to provide sufficient air to reduce the percentage of CO_2 to a living condition.

The composition of pure air is approximately 21 per cent oxygen, 79 per cent nitrogen, and 0.034 per cent CO_2 . This is the air which enters the lungs, but on being exhaled the composition becomes 16 per cent oxygen, 79.6 per cent nitrogen, and 4.38 per cent CO_2 . The oxygen has therefore decreased and the CO_2 increased. From these figures and the fact that at one breath 25 cubic inches of air are inhaled, at a rate of breathing of 18 times a minute, it may be calculated that each member of the crew will liberate 0.7 of a cubic foot of CO_2 per hour.

It then becomes necessary to determine just what percentage of respired CO_2 may be allowed in the living quarters. While the

amount of CO_2 in the atmosphere is very small, 0.034 per cent, if it should be increased to 1 per cent by the addition of chemically pure CO_2 , it could be breathed without disagreeable results. But if this amount of expired CO_2 were present, the air would be unfit to live in continuously. If it is desired to maintain a percentage of respired CO_2 of 0.02 per cent (a figure established by some eminent writers on the subject) it will be necessary to provide each man with 3,500 cubic feet of fresh air per hour. This amount of air per person, while perhaps desirable, is seldom obtained, even in hospitals, shops, theaters, schools, and other buildings. In the latter cases the usual supply of air per person varies from 20 to 40 cubic feet per minute (or 1,200 to 2,400 cubic feet per hour).

In crew spaces on naval vessels it is usual to allow 35 cubic feet per minute (or 2,100 cubic feet per hour), which, if properly distributed, would give good results, but it is, of course, impracticable to install the numerous small outlets to obtain absolutely uniform distribution, and as a consequence some men may be subject to pure air with drafts and others to foul air and insufficient circulation. As a result it is not uncommon for the crew to stop up the ventilation outlets, which adversely affects the general results.

The amount of air referred to above would only provide for a sufficient renewal for keeping the respiratory CO_2 to a comfortable working condition and does not in itself provide for carrying away the wild heat, which is a variable quantity and differs in all the compartments. Separate and usually additional allowance is made for caring for the heat in spaces especially subjected to such artificial heat.

In any calculation of the necessary air required for proper ventilation, theory must be combined with practice and judgment, and the final error frequently requires to be corrected during that period of a ship's commission just prior to her final acceptance, as it is only at this time that some of the real effects of wild heat can be determined.

From the latest ship specifications the following rates of change of air in various compartments are quoted, these rates of change having been obtained from past experience in combination with a theoretical determination:

Officers' quarters and crews' space not inclosed by armor, in from 10 to 12 minutes.

Officers' quarters and crews' space inclosed by armor, in about 4 to 6 minutes.

Sick-bay quarters, in about 8 minutes.

Water-closet spaces, in about 4 minutes.

Storerooms, in from 15 to 30 minutes.

Engine and steering engine rooms, in about 2 minutes.

Steering-gear compartments, in about 8 minutes.

General workshop, in about 4 minutes.

Switch and distribution board rooms, central station, fire-control booths, and interior communication rooms, in about 6 minutes.

Refrigerating machine rooms, in about 4 minutes.

Evaporator rooms, in about 4 minutes.

Dynamo rooms, in about 4 minutes.

Windlass engine room, in about 4 minutes.

In a warship, necessary as ventilation is, it must, after suitable provision has been made for the general health of the crew, take somewhat of a secondary position with relation to the prime function of the ship—the carrying of the two military features of armament and protection.

This being the case, the elaborateness, finish, and the finer attention to comfort that can be paid to such systems on purely passenger ships must often be wanting.

Until very recently all naval ventilation systems were with cold air solely. The cold air has been blown in low down, with the idea that as it became heated it would rise. This has generally given rise to the complaint of cold feet. It has been blown in high up, and in crews' hammock space complaint has been made that the men sleep cold in their hammocks.

To blow it in at half height means either that the duct must be led to a bulkhead, where it can be taken down to the desired height, or it will be an obstruction.

An unmilitary obstruction is a frequent cause of complaint and is unjustifiable.

The present movable type of outlet called the McCreery elbow solves the question reasonably well and allows the duct to be kept out of the way and the air to be directed up, down, or in any other direction desired.

On the *Vermont* a test installation was made with one system in which heating and ventilation were combined. The reports received early in 1908 from the ship were so good that we felt justified in extending the system. The following is quoted from a report by the chief engineer of this ship:

This vessel having been in commission during a rigorous New England winter, I deem it fitting to submit the following special report on the experimental heating system installed in the lower wardroom and sick bay of this ship:

For some years the merit of indirect heating for ships has been under discussion, but no action was taken until the superintending constructor and the inspector of machinery at the Fore River Works jointly recommended to their bureaus that the experiment be made on this vessel, each bureau retaining full control over its own part of the installation. The bureaus concerned authorized the installation of thermotanks to supply heat to the lower wardrooms and mess room and to the sick bay.

Aft in the blower room in the angle between berth and protective deck over the rudder head is built an air-tight tank containing three series of steam coils,

three coils in a series. There is one steam line and return line from the port engine room. The two electric blowers take fresh air from the after quarter-deck ventilators and deliver it over the heated coils, thence to the living spaces, where the supply can be partially regulated by louvres.

During the builders' trial in December, 1906, in weather below zero the ward-room spaces were kept at a temperature of 110° F. This demonstrated clearly the heating efficiency of the plant. The opinion of the ship's officers on that trial as well as the Board of Inspection and Survey was that it would be difficult to regulate the quantity of heat supplied or maintain a given temperature, or vary it at will; but the experience of last winter shows that it is a perfectly easy and simple matter to regulate the temperature to any degree desired. The only possible objections to the system are these: Lack of normal atmospheric humidity, which may be readily corrected by allowing a small amount of steam to spray into the thermotank from a nozzle on one of the heating coils; and the difficulty of providing each individual with the temperature that he prefers. This last objection has no weight in the sick-bay installations, because the surgeon prescribes the temperature and we maintain it; nor could it have any weight in heating crew space, because there again competent authority would fix the temperature desired. The fact that a wardroom mess of 17 officers has been satisfied during the past winter with the even temperatures and the perfect control seems to dispose of this last objection altogether. Set over against these objections are the following real and unmistakeable advantages: Greatly reduced weight; elimination of unsightly, leaky coils; reduced number of leaky joints and valves; and the elimination of the water ram that occurs daily when steam is turned on.

In view of my experience, I am unqualifiedly of the opinion that the indirect heating system is the proper one for heating warships, and recommend its adoption for installation in vessels building.

Beginning with the *Florida* and *Utah*, the heating and ventilation have been combined for the systems supplying crews' quarters, offices, and some other spaces. This combined system was not carried to storerooms nor to other places where heat was not necessary.

The combined system permits the regulation of the temperature to a uniform degree. The piping is so arranged that the temperature may be controlled through part of its range by regulating the proportion of cold air and heated air, and through the balance of the range by regulating the heat.

From the point of view of the constructor, the combined system has the advantage of saving weight and wall space by doing away with the old radiators. It prevents accumulation of dirt and is economical of fuel.

It sometimes presents difficulties in getting the steam coil box located without interference with head room or other essential features. Medical officers' reports have been generally favorable to such a system.

There is, however, one objection to this combined heating and ventilation which may also apply to a greater or less extent in any system of heating, and that is the relatively low humidity that results.

This is a matter of much importance, as the necessity for moisture is apparent in this system, and has been the subject of much comment.

It might appear that the introduction of a small amount of steam into the heated air would be the simplest remedy, but, while this has been done in certain cases, it is found to be unsatisfactory unless the steam supply is constant, automatic, and of approximately the right amount.

The simple operation of opening a valve for a short time or of leaving it open does not relieve the condition, as it is possible that with this arrangement the spaces might be saturated with moisture.

There are a number of machines in use in buildings on shore which automatically wash, heat, and humidify air to any desired temperature or relative humidity, but the apparatus is heavy and complicated and takes up considerable space, and whether it would prove satisfactory on a naval vessel is questionable.

It is proposed, however, to install a machine for test on the *Florida*, and the further use of such apparatus will depend to some extent on the results of this test.

The magazine refrigeration system as usually installed is the converse of this combined heating and ventilating system; that is, it is a combined cooling and ventilating system. It has certain features peculiar to itself, but in essentials the systems are identical.

The question of the location of blowers is one of importance.

The longer and more circuitous the lead to the blower the worse from a productive standpoint. On the other hand, a blower can not well be located in the open, and if located anywhere outside of armor will be expended early in an action.

For those blowers that are in the nature of luxuries or pure comforts a location outside of armor is justifiable.

For blowers on which human life or the military efficiency of the ship depends, such as engine-room blowers and magazine blowers, the location must be the best possible.

These blowers are therefore in the latest ships not only placed behind armor, but below the protective deck, to provide, so far as possible, for their preservation in action.

The location and form of inlet cowls to blowers is also a matter that requires special attention. For systems that are to be run during action these cowls must be located, as far as possible, so as to avoid sucking in smoke or the fumes of explosive shells. They must be placed so as not to interfere with the use of turrets or smaller guns. The ventilation for turrets themselves is now either taken through the roof or through the underhanging shelf plate at the rear. Cowls located where exposed to sea or spray must either be removable, be unusually high, or be of special form.

Various kinds of cowls of the mushroom type or special form have been tried for such purpose, but without exception it is found that from an efficiency point of view they are all inferior to the standard form similar to that used on merchant ships.

In special cases, however, the lack of efficiency must be accepted and the special form fitted.

The ventilation of the most modern warships may be illustrated by the following examples, which represent typical cases on board such ships:

GUN DECK AND THE SPACES THEREON.—This deck in a battleship is usually from 12 to 14 feet above the water. It is the next deck below the weather and there are plentiful air ports and gun ports in the side and companion hatches and skylights above. It is ordinarily not artificially ventilated and, so far as conditions go, requires artificial ventilation no more than a large room on shore.

STOREROOMS.—Storerooms are down in the depths of the ship. Air to get to them would have to follow a circuitous and unnatural route, and they are not customarily occupied by men. They are therefore usually fitted with plenum ventilation and the air is allowed to escape by the natural routes of hatches, doors, etc., provided for other purposes, and in special cases exhaust pipes are fitted.

DYNAMO ROOM.—Here we have a condition with artificial sources of heat within the space. The room is, however, relatively small and high and lends itself to the fitting of exhaust trunks, which trunks indeed have to be provided for other purposes. They are generally fitted with forced ventilation and natural exhaust through specially prepared openings. Recent experience has, however, indicated that forced exhaust ventilation, as well as forced supply, is desirable.

ENGINE ROOM.—Until recently engine rooms were fitted as described under dynamo room, but with the large radiating surface of the turbine, the relatively small hatch that can be fitted and the necessity for ample protection to the main propelling mechanism of the ship, considerable hot pockets resulted, so that the most modern systems have air forced in and air drawn out both by fans, the leads for both inlet and exhaust systems being taken to the various parts of the space to relieve hot pockets and to furnish air for the occupants of the rooms. The number of outlets, however, is reduced to the smallest number practicable and the area of each correspondingly enlarged.

It is desirable from the efficiency standpoint to have the air introduced at the highest velocity practicable, but if this velocity is too high disagreeable whistling occurs, so that it has been found necessary to limit the velocity to 1,500 feet per minute.

For living spaces it is endeavored to introduce not less than 35 cubic feet per man per minute, though when the space is so located

as to provide readily for natural ventilation this is allowed for and not all the air is introduced by fans.

Experiments have been made with various forms of cinder and dust extractors, but invariably they have shown a large reduction in efficiency of the system. As the principal source of such cinders and dust is the coal burned, and, as we are now changing to oil burning, this particular difficulty should decrease in importance.

The foregoing indicates in a general way the designer's view of the problems of ship ventilation.

The writer feels, after seeing many foreign ships, of all nations, that more weight, space, and power are assigned to ventilation in United States warships than in those of any other navy in the world.

Any improvement possible in the operation or installation of such systems should be aimed at and experiments are continually under way to this end, but it is questionable whether the assignment of more weight and power to this feature than is customary in our most recent ships is at all warranted in view of the sacrifices it entails.

The designer is naturally torn between the conflicting desire to provide the maximum of comfort and the desire and necessity of keeping all weights down and allowing a minimum of interference with necessary military features of a ship which are the first requisites of the problem to the military naval architect.

PLANS AND DESCRIPTION OF A HOSPITAL SHIP FOR THE UNITED STATES NAVY.¹

By Surgeon E. M. BLACKWELL, United States Navy.

In presenting plans for a hospital ship for the United States Navy, I desire to make some general remarks before entering into the details of the plans.

There never has been a hospital ship built up from the keel for the purpose of treating, caring for, and transporting the sick and wounded; consequently, there never has been a satisfactory, up-to-date, properly constructed hospital ship, and there never will be one until it is planned, designed, and built up from the keel by experienced naval constructors and engineers, advised and assisted by medical officers of experience with hospitals and hospital ships and skilled in practical hygiene. All hospital ships up to the present time have been merchant ships or cruisers converted into floating hospitals, and they have been unsatisfactory, as it is more impracticable to convert a merchant ship into a satisfactory, up-to-date hospital ship than

¹ Read before the conference of the Medical Officers of the United States Atlantic Fleet, Guantanamo, Cuba, February, 1912.

it is to convert an ordinary dwelling or factory into a modern, up-to-date hospital. Medical men are aware of how impracticable it is to convert an ordinary building into a properly appointed modern hospital. You can have just as good equipment in a dwelling or factory or on board a merchant ship, but it can not be installed, disposed of, or used to as good advantage as it can in a house or ship built for the special purpose of its reception, installation, and operation.

In building houses or ships sanitary precautions are not gone into so thoroughly as in hospitals and as they should be in hospital ships; and it is generally impracticable to correct these errors of sanitation so as to bring them up to the sanitary standards and requirements of modern hospitals and hospital ships. Converted hospital ships have done good work, and the sick are much more comfortable aboard them than aboard battleships or other cruising ships; but at best they are makeshifts, and the sick could be more easily, comfortably, and economically cared for aboard one that is properly designed and constructed.

To be satisfactory, convenient, comfortable, and economical, any building or ship must be designed and built with a special eye to the purpose for which it is intended, and these ends can not be attained by using a building or ship for purposes foreign to those for which it was intended. All hospital ships of the present day are merchant ships converted into floating hospitals at considerable time, expense, and labor; but, after all this, they are unsatisfactory, inconveniently arranged, hard to keep clean and sanitary, and far behind the sanitary requirements of modern times. To the casual visitor or observer aboard one of these ships these defects are not so apparent, but to one who has served aboard and has lived in daily combat with the problems of cleanliness, sanitation, the care, subsistence, treatment, and comfort of the sick and crew, these defects are very apparent, vivid, and realistic. Then, in converted merchant ships changes and alterations are continually being made in the vain effort to attain that end which can only be reached by building a proper hospital ship from the keel up. These never-ending changes and repairs are a constant source of expense, worry, and discomfort.

The difference in cost of running and keeping up a properly built hospital ship during its lifetime and a converted merchant ship would probably be enough to build an up-to-date hospital ship, not to speak of the increased comfort and convenience to all on board. In any ship, building, or institution the question of paramount importance is maintenance and not the first cost of building; therefore it behooves us to build a ship that can be run with the greatest economy and that requires the least expenditure for preservation and upkeep.

As hospital ships have well demonstrated their necessity and usefulness, it is safe to predict that the Navy will never be without them in the future, and therefore we should have satisfactory, properly constructed, and up-to-date ships. They would not go out of date or become obsolete in a few years and have to be sold for old junk or shot to pieces as our battleships are, but they would last for many years. The equipments might become old and out of date, but with good hulls, with proper internal arrangements for wards, berthing spaces, and other compartments these could be easily renewed and the ships kept up to date.

We should have at least two ships, one for each coast, of about 250 beds each, normal capacity, and which could be expanded in times of need to 400 or 500 beds for short periods. These ships would be base hospitals to accompany the fleets on the two coasts, and in time of war they could be supplemented by any required number of ambulance ships, which could be easily obtained from the merchant service. These ships as nuclei, with a sufficient number of ambulance ships, would meet all the exigencies in time of war. Of course it would be more satisfactory to have a greater number of hospital ships to care for the sick and wounded in time of war, but the expense of building and maintaining them for such an emergency would be practically prohibitive. We must consider the economical and practical sides of this question as well as the utilitarian side. When we consider the large amounts expended for military purposes and the difficulty of getting adequate appropriations for the building programs and running expenses of the Navy, it behooves us to proceed with caution in recommending large outlays. Many merchant ships are well adapted for transportation purposes, and if they are not they can, easily and in a very short time, be converted into ambulance ships for transporting the sick and wounded from the front or from foreign stations to the various hospitals in the United States. In times of peace they can be used for a great many different purposes, while hospital ships could only be used for one purpose, and all but one on each coast would probably be idle and of considerable expense to the Government for preservation and upkeep.

The most practical solution, then, of the question would be to have two good hospital ships of sufficient size, one for each coast, in time of peace and to supplement these in time of war by the required number of transports or ambulance ships with a few naval surgeons and Hospital Corps men on board, supplemented by volunteer medical officers and Hospital Corps men or Medical Reserve Corps officers and men. As the United States has rather extensive foreign possessions, it would probably be very desirable to have a medium-sized hospital ship for service in the Philippines and to visit at times other out-

lying possessions. It would be well to build one ship in the next year or two and another in the next five years. The knowledge among the enlisted personnel that when sick or wounded they would have the best of comforts, care, and treatment on board an up-to-date hospital ship would make them much more contented and also encourage men to enlist, reenlist, and remain in the service, to say nothing of the satisfaction and contentment of their relatives at home.

Hospital ships should be large and roomy, with plenty of air space in the wards and other living compartments, and ample deck space for exercise and recreation for the sick and the crew. They should be built with special considerations regarding sanitation, comfort, and convenience. Luxury is not a necessary adjunct, and it means increased expense, labor, and worry, makes proper sanitation harder to attain, and is generally conducive to negligence and inefficiency. Everything should be banished from a hospital ship that is not necessary for the comfort and contentment of the patients and crew. The workmanship should be plain and simple, with as few angles, corners, and ornamentations as possible to catch dirt and dust and harbor microbes and vermin. All parts should be accessible for cleaning and other sanitary purposes. All the fittings should be plain and simple and capable of being thoroughly cleaned and sterilized. There should be all sorts of labor-saving devices and machinery, so that the hospital corps and crew could be reduced to a minimum, thereby cutting down the running expenses as much as possible.

The wards should be high above the water, light and airy, with good natural and artificial ventilation and with convenient and easy communication with the rest of the ship. No ward should have to be used as a gangway or passageway to get from one part of the ship to another. There should be wide passages, gangways, elevators, stairways, and hatches to facilitate communication. The wards should be removed as far as practicable from the machinery spaces, so that the sick will not be disturbed by noises. The auxiliary machinery should, as far as practicable, be placed on the lower deck, amidship, around the fireroom and boiler-room uptakes, leaving the forward and after parts of the ship free for the sick. The administrative, executive, and working parts of the hospital department should be centrally located and closely connected to facilitate communication and thus obviate loss of time. Communication should be ample and easy between the various decks and between the different parts of the same deck. Great care should be exercised in installing apparatus in the various departments.

In presenting these plans of a hospital ship for the United States Navy for consideration I do not desire to pose as an authority on the subject; but having served for nearly three years on a hospital ship, and having been in daily contact during that time with the

details and problems that continually confront one on board, I have learned many of the necessities and helped to solve many of the problems, and if I can add anything to the sum total of knowledge on the subject that will be of any use for medical officers of the Navy who will have to take up and continue the work, I shall feel amply repaid for the time, thought, work, and study I have given it. The first hospital ship to be built is not going to be perfect or all that is to be desired, as these ends can only be gained by long experience and practice, but it will be a great advance over the present hospital ships of the service in every way, and the second hospital ship will be better than the first on account of the knowledge and experience gained in building the first.

The plans here presented for consideration are far from being complete, as, not having been schooled in the sciences of naval construction and architecture and steam and electrical engineering, I am not competent to work out with any degree of accuracy the details necessary for the construction of a hospital ship. I have endeavored to give a general outline of the arrangements that should be in the hospital department of a ship and leave space enough for the installation of the engines, boilers, and auxiliary machinery, and then leave the working out of the details along these general lines to competent naval constructors and engineers. Having had a rather lengthy service on board a hospital ship, having met and battled with the various problems that arose and confronted me there, and having formulated many changes that were made on board for increasing the comfort, capacity, and efficiency of the ship, the knowledge and experience so gained has been of material value to me in planning and designing a hospital ship. These imperfect plans have been worked out after careful study of the various needs in active service with the Atlantic Fleet for nearly three years, aided by daily contact and experience with these necessities during that time.

It will require a great deal of thought, study, care, and work to install the proper apparatus, furniture, and equipment. Special designs should be worked out for certain apparatus, in order that they may be satisfactory. Every piece of equipment should be studied to ascertain whether it will meet all requirements. To this end, from the time the keel is laid until the ship is fully finished and equipped, it will require a corps of experts in the various departments to be constantly present to inspect the work and supervise the installation of the various machinery and equipment. Medical officers engaged in superintending this work should be fully informed in all that concerns the outfitting of the ship. To this end they should know the most modern methods and equipment in the various departments. They should visit the big hospitals, study their arrangements, equipment, and other features that might be of use.

They should go to the hotels in the large cities and the trans-Atlantic steamships and study the commissary and galley arrangements; then to the various factories, shops, and business houses and examine their apparatus, all the various types of which should be carefully gone into before final selection is made.

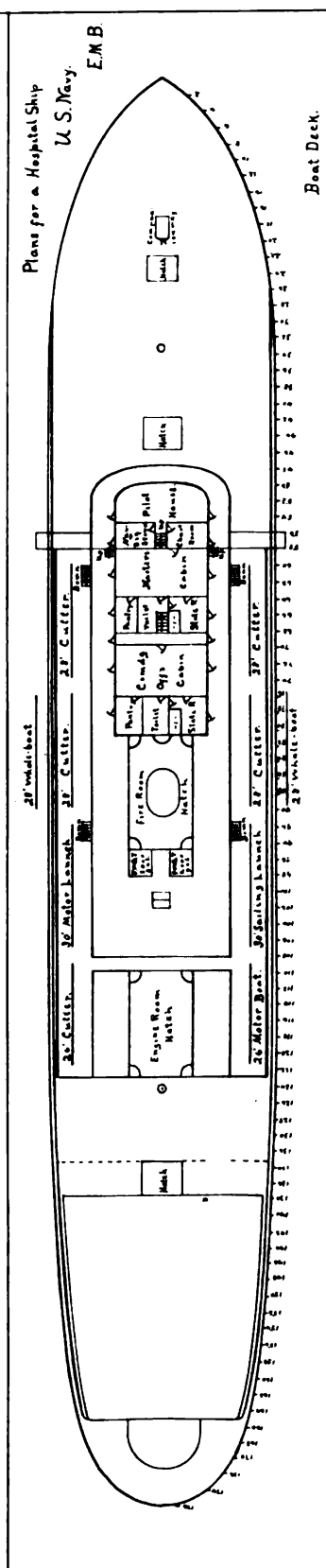
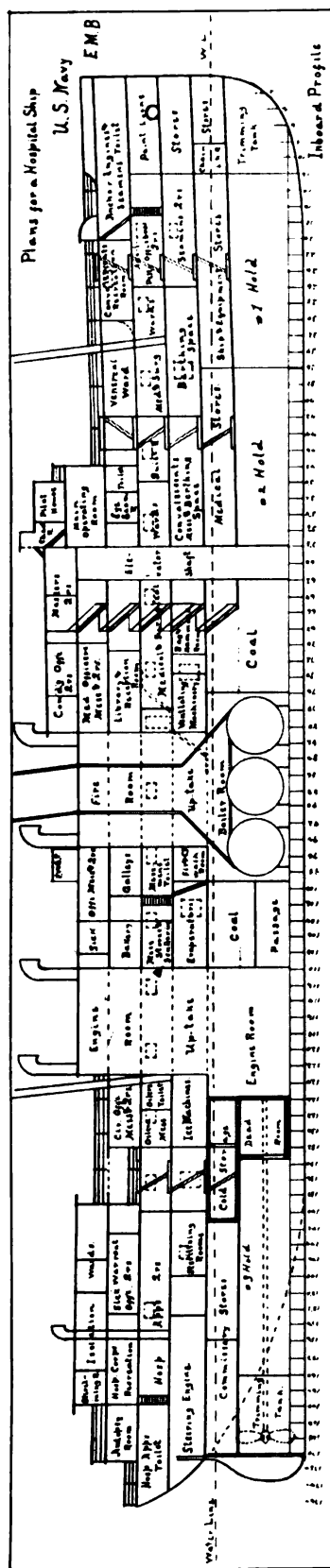
A system of vacuum cleaning should be installed throughout the vessel, and all parts of the ship should be connected by telephone. The dynamos should be sufficiently large to run the winches, anchor engines, and other auxiliary machinery, thus obviating the necessity of leading steam pipes about the ship and distributing wild heat. Very special attention should be given to the cold-storage plant. There should be all the necessary kinds of labor-saving machinery, and, as stated before, the ship should be built with a special eye to comfort, usefulness, and sanitation, and to this end the workmanship should be simple and substantial, all unnecessary ornamentation and luxuriousness being prohibited; but it should be equipped with everything necessary for the comfort, contentment, care, and treatment of the sick.

Before closing I desire to impress again upon you the futility of expecting to make a satisfactory hospital ship out of a merchant ship or obsolete cruiser. They can never be anything but makeshifts. As I have said before, the only possible way of getting a satisfactory hospital ship is to have it "built up from the keel by competent naval constructors and engineers, advised and assisted by medical officers of experience with hospitals, hospital ships, and skilled in practical hygiene."

To get the best results, you must have skilled workmen with special tools for the construction in hand and a special plant for carrying on this work. Hence to attain the end desired in caring for and treating the sick and wounded you must have the best doctors, modern and up-to-date equipments, hospitals, and hospital ships, and we should not be satisfied with anything less. The efficiency of the fighting forces depends in great measure upon the efficiency of the medical department, and the efficiency of the medical department depends, first, upon the personnel composing it, and, secondly, upon the facilities and equipment with which they are provided. Therefore, for the good of the Navy at large, it behooves all branches of the service to work together for these ends.

GENERAL DESCRIPTION OF SHIP.

In June, 1911, the writer submitted to the Bureau of Medicine and Surgery plans and description of a hospital ship of about 10,000 tons, 500 beds and extra berthing space for about 300 more patients, making a total of 800 besides the crew. These plans were made with



a view to having the Medical Department fully prepared in case of war. The bureau did not consider that the present needs of the service required such a large vessel, and suggested that a ship of about 200 beds would be sufficient for some years to come, in time of peace. Besides, the expense of building so large a ship would be greater than it was thought advisable to ask for, and a smaller one was thought more advisable until the subject of hospital ships was more fully developed. Acting on these suggestions, the writer submitted plans in September, 1911, for a smaller ship of about 6,000 tons, 250 beds and extra berthing space for 150 more patients, making 400 besides the crew. It would not be advisable to have one of smaller size than this on account of the lack of space and stability that it would necessarily have. Stability in a ship is one of the greatest factors in the care, comfort, and treatment of patients on board, and every effort should be made to obtain it. These plans provide for a ship with very broad beam in proportion to its length, which will make her steady, comfortable, and roomy. She will be high out of the water, but all the heavy weights will be below, which will give her the required stability.

Length over all	feet...	352
Length water line	do.....	340
Breadth molded	do.....	56
Depth molded	do.....	40
Draft water line	do.....	22
Displacement	tons...	6,000
Complement:		
Naval	70	
Auxiliary	115	
Total	185	
Beds for sick	250	
Extra berthing space	150	
Total	400	
Triple expansion engines, indicated horsepower	6,000	
Twin screws	diameter, feet...	15
Speed	knots...	12-16
Bollers, 6 Scotch:		
Length	feet...	12
Diameter	do.....	14
Coal capacity, 1,500 tons.		

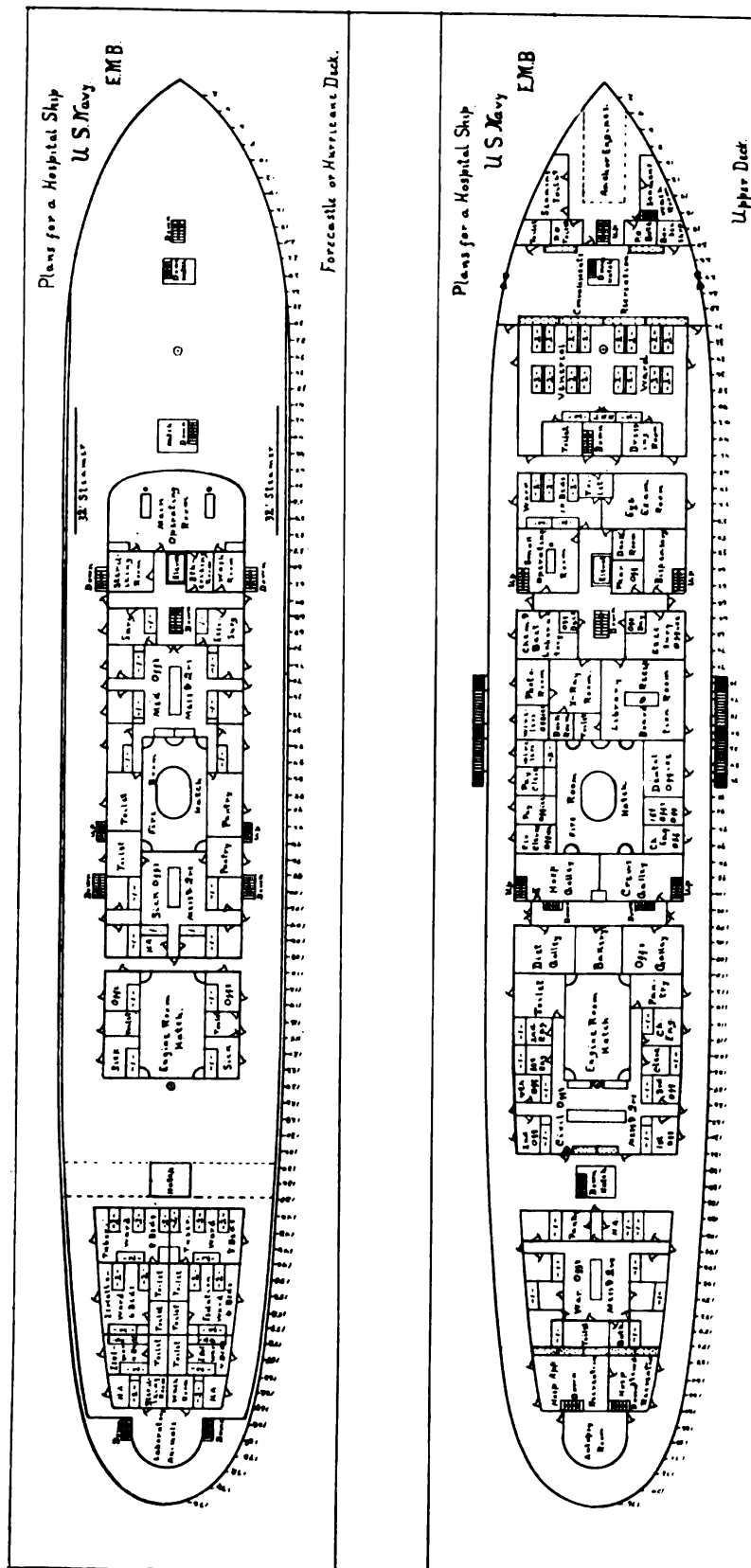
There are seven decks to this ship, including boat deck and hold, and a brief description of each is here given.

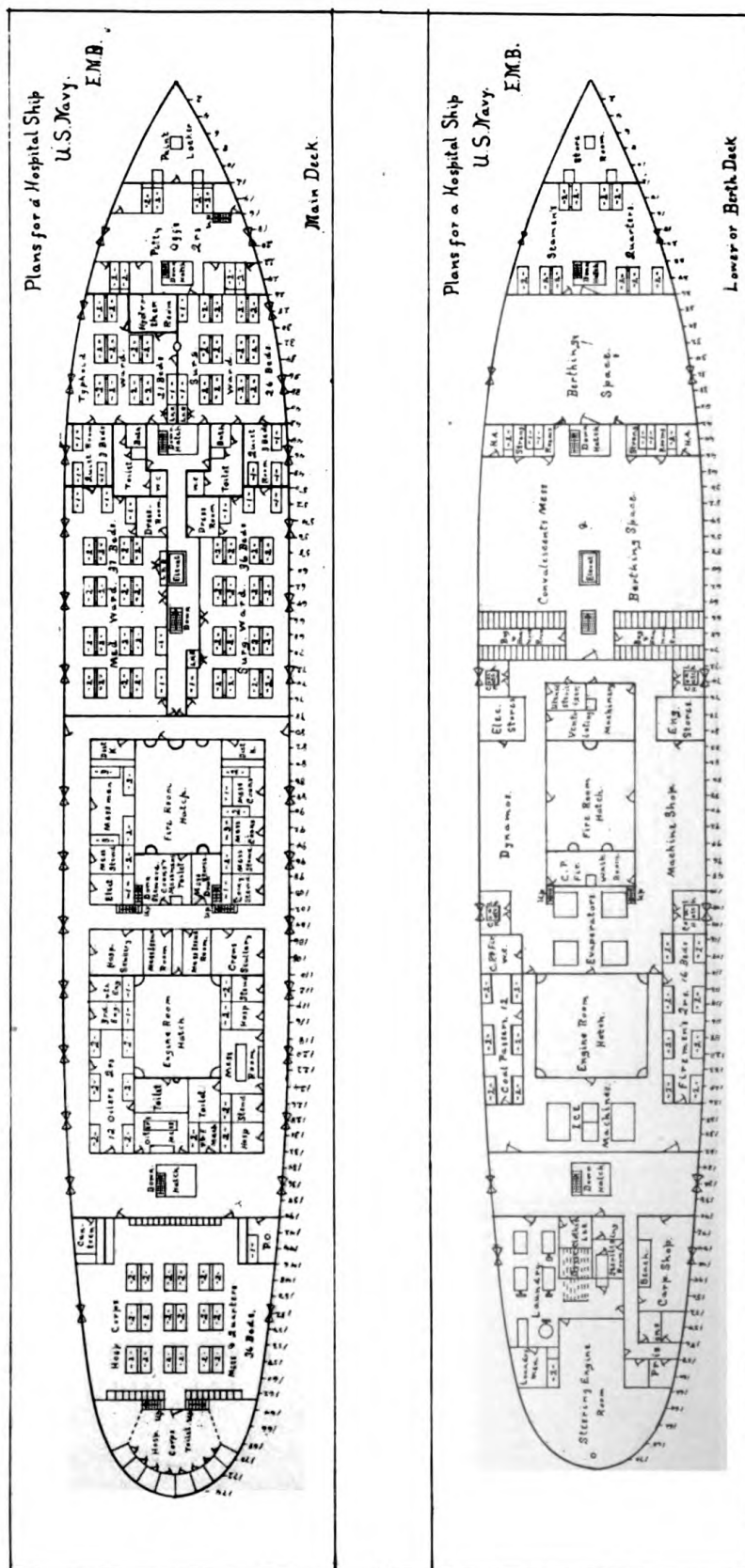
The **BOAT DECK** begins at frame 48 and runs aft to frame 123. On it is a deck house containing the pilot house, on top of which is the bridge; a chart room and navigator's storeroom; the master's quarters; and the commanding officer's quarters. The fresh-water gravity

tanks are on this deck, aft of the smokestack. There is a wide gangway around the deck house extending aft to the end of the deck. There are 10 large boats on this deck, with patent davits for hoisting and lowering, viz, 2 motor boats, 2 whaleboats, and 6 cutters. This deck is 34 feet above the water.

THE FORECASTLE AND HURRICANE DECK begins at the bow and extends aft to frame 170. It has a deck house beginning at frame 48 and ending at frame 123, in which are located the following compartments: The main operating room, with sterilizing, etherizing, and wash rooms attached; ward room, with 8 staterooms, pantry, and toilet for medical officers; sick officers' quarters, consisting of mess room and pantry, 10 staterooms, and 3 toilets. On the after part of this deck, between frames 139 and 164, a deck house containing the 6 isolation wards with a combined capacity of 52 beds, two rooms for nurses, and wash and sterilizing rooms. Each ward has its own toilet and is a separate unit in itself. Laboratory animals are kept aft of this deck house. The forecastle extends aft to the forward deck house and has two 32-foot steamers on the after part of it. It affords ample space for exercise and recreation for convalescent patients. A companionway and two large hatches with ladders in them lead down to the compartments below, making communication ample and easy. The hurricane deck runs along the sides and around the after part of the deck house and affords an excellent place for exercise and recreation for the ship's officers and sick officers. Communication is had with the decks above and below by stairways and ladders, and there is an elevator that leads from this deck clear through to the hold. There is a wide gangway around the isolation wards, so that contagious cases can get out on deck and get fresh air and sunlight. This deck is 26 feet above the water.

THE UPPER DECK extends the whole length of the ship. Forward are the anchor engines, ship's petty officers' and seamen's toilets and wash rooms, aft of which comes the convalescents' recreation room, with barber shop and toilet attached. Just aft of this room the sides of the ship are cut away from the forecastle deck down to this deck, and a 6-foot gangway runs down each side of the ship to and around the stern. From forward, aft, the following compartments are located on this deck, viz, a venereal ward of 40 beds with dressing room and toilet; an eye examining room with dark room, toilet, and small ward of 10 beds attached; dispensary; pharmacist's office and small operating room; offices for executive officer, officer of the day, and officer of the deck; bacteriological and chemical laboratories; X-ray and photographic rooms; library; board and reception room; dental, first officer, chief engineer, wireless, civil clerk, pay offices, wireless operators, and pay clerk's rooms. There are 4 galleys and a bakery, centrally located and very accessible to all parts of the ship, with





dumb-waiter and ladders leading below, where overhead food carriers will distribute food to the main wards and messes of the ship. The auxiliary officers' quarters, consisting of mess room, pantry, and toilet, and 8 staterooms, come aft of the galleys. Then comes a 14-foot athwartship passage with a large hatch in the center, aft of which come the sick quarters of the junior and warrant officers, consisting of mess room, pantry, toilet, and 9 staterooms. Aft of these are two recreation rooms for the hospital corps, aft of which is the autopsy room. This deck is 18 feet above the water.

THE MAIN DECK has storerooms forward, aft of which come the quarters of the ship's petty officers, aft of which, between frames 22 and 78, come the main wards of the ship. There are 2 medical and 2 surgical wards with dressing rooms and toilets attached, and also a hydrotherapeutic room. There are also 2 quiet rooms of 3 beds each. The total capacity of these wards is 136 beds. Just aft of the wards are 2 small diet kitchens where nurses can prepare special food and diets for patients at all hours. Between frames 78 and 140 around the fireroom and engine room uptakes are grouped the quarters of some of the engineer officers, hospital stewards, commissary and mess stewards, mess cooks and boys, machinists and oilers, with mess rooms, mess issue rooms, sculleries, toilet, and wash rooms. On the after part of this deck are the canteen, post office, hospital, apprentices' quarters, and toilet. There are 30 large, square ports on this deck besides smaller ports, which give excellent light and ventilation to the wards and other living spaces. This deck is 10 feet above the water.

THE LOWER OR BERTH DECK has a storeroom and seamen's quarters forward, aft of which, between frames 26 and 71, come 2 large berthing spaces capable of accommodating about 150 convalescent patients when it is necessary to crowd the ship to its fullest capacity. Strong rooms for the insane and two bag and hammock rooms open into the after one of these compartments. Between frames 71 and 110 around the fireroom hatch is most of the auxiliary machinery, utensil sterilizers for the wards, engineer and electrical storerooms, machine shop, dynamo room, evaporators, and firemen's and coal passers' wash room and toilet. There are 2 large cargo ports on each side of this space, which open into handling rooms, with large coaling hatches in them. These handling rooms have water-tight doors in the inner bulkheads, so that coaling can be done entirely in these rooms and practically outside of the ship. Between frames 110 and 132 on either side of the engine-room uptake are the firemen's and coal passers' quarters, and the refrigerating machinery is aft of it. The laundry, dry room, clothes locker, and laundrymen's quarters are on the port side in the after part of this deck, and the

carpenter shop and ship's prisons are on the starboard side. Between these are the main sterilizing and disinfecting rooms. The steering-engine room is in the extreme after part of this deck. This deck is 2 feet above the water.

THE ORLOP OR STOREROOM DECK has the ship's storerooms forward, aft of which are the medical storerooms. These are accessible through large cargo hatches, which have ladders leading up and down. The elevator and a stairway also run down to the medical storerooms and hold. The upper parts of the coal bunkers, boiler room, and engine room are amidships, between frames 65 and 126. Aft of frame 126 come the cold-storage rooms, eight in all, and the commissary storerooms, seven in all. A large hatch with freight elevator and ladder runs down into this space, making the storerooms very accessible.

There are 3 holds, one forward for ship and equipment stores, aft of which is one for medical stores. Large cargo hatches lead down into these holds, and the elevator runs down to the one for medical stores. The coal bunkers, boiler room, and engine room occupy all the space between frames 58 and 126. The dead room comes aft of the engine room, and then comes the after hold for stowing coffins, lumber, and other heavy material. A large cargo hatch with freight elevator opens into this hold. There is a large fresh-water storage tank on the outboard side of each shaft alley.

Attention is called to the excellent means of communication between all parts of the ship. There are wide passages and gangways to facilitate communication between the various parts of the same deck and elevators, stairways, ladders, and hatches to facilitate communication between the different decks. None of the wards has to be used as a passageway or gangway to get from one part of the ship to another. A ward should never have to be used as a passageway or for any purpose other than caring for and treating the sick. The forward elevator and stairway adjacent to it extend from the boat deck down to the hold, passing from the commanding officer's quarters through the spaces occupied by the medical officers' quarters and operating rooms, the administrative, executive, and other offices, laboratories, dispensary, X-ray room, wards, berthing spaces, medical storerooms, and hold, giving excellent communication between all these compartments. The galleys are centrally located and are very convenient to all the principal messes. Movable cots should be installed, so that they could be put out of the way, or wards could be cleared of all those that are not in use or filled up with them when there is a big influx of patients. The writer has designed a cot, several of which are in use on the U. S. S. *Solace*, which meet these conditions admirably.

Conditions can never be ideal on board a hospital or other ship on account of the lack of space and consequent crowding and congestion,

and things have to be adapted to meet conditions and circumstances as they exist. Sometimes good ventilation and sanitation will have to be sacrificed on account of convenience and lack of space, and vice versa. It will require excellent judgment to determine just what features should be sacrificed for other features, in order that the ship as a whole may be best adapted to the uses for which it is intended.

A REPORT ON THE PREVALENCE OF FRAMBOESIA (YAWS) IN GUAM, AND ITS CONNECTION WITH THE ETIOLOGY OF GANGOSA.

By Assistant Surgeon WILLIAM M. KERR, United States Navy.

On reading a description of framboesia (yaws) in the Manual of Tropical Medicine, by Castellani and Chalmers, 1910 edition, the writer, together with other medical officers in Guam, was impressed with the similarity of tertiary yaws as described by the above authors, and some cases of gangosa as found in Guam, and as a part of an extended study of the etiology of gangosa, which has been undertaken by various medical officers on this station, he endeavored to determine the extent of yaws (past or present) among the normal, native inhabitants of Guam and to find out what relation, if any, this disease had to gangosa. As most of the cases of gangosa originated in the outlying towns and ranches, and as these places more or less show conditions of living as they existed under Spanish rule, it was thought that inquiry in these districts would be more profitable than in Agaña or Sumay, where American occupation has brought about better sanitary conditions than exist in the smaller towns. Umatac, Merizo, Ynaran, Agat, Piti, Tepungen, Asan, Anigua, Sinajaña, Dededo, and the leper colony, which in fact comprise all of the inhabited spots in Guam outside of Agaña and Sumay, were chosen as the field of investigation. A house-to-house canvass was made, and when it was completed the following data were at hand:

Number of normal people giving a history of yaws and presenting yaws scars and the scar of the mother yaw.....	1,311
Number of people who did not know if they had had yaws or not but who showed scars.....	88
Number of people who did not know if they had had yaws or not and who showed no scars.....	25
Number of children under 10 years of age who never had had yaws.....	534
Number of adults who gave no history of yaws and who showed no scars.....	471
Total number examined.....	2,429

By excluding children under 10 years of age who never had had yaws and who are liable to become infected in the future, we find

that 73.8 per cent of the natives examined have had yaws, which occurred generally in early childhood.

Attention was then directed to the cases of gangosa, 315 in number, all of which are recorded on a card index kept in the office of the United States naval hospital, Guam. These cases are divided into three groups (Odell and Garrison) :

(a) Rhino-pharyngitis Mutilans (Leys)	116
(b) Rhino-pharyngitis Mutilans (Leys) plus ulcerations elsewhere.....	59
(c) Ulcerations elsewhere only	140

Total number of cases at the date of this report.....	315
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Each case and often the mother of the case was carefully questioned, with the following result:

Number having had yaws who knew where the mother yaw had been and who presented scars of yaws.....	205
Number having had yaws and presenting scars of yaws but who did not know where the mother yaw had been.....	46
Number who did not know if they had had yaws or not but who presented scars.....	6
Number who claimed never to have had yaws but who presented yaws scars	5
Number who did not know if they had had yaws or not and who presented no scars.....	28
(Note liability of yaws scars being obliterated by gangosa scars.)	
Number who claimed never to have had yaws and who presented no scars	18
Number on the list who could not be found for examination.....	7
Total.....	315

From the above table we find that 85 per cent of those examined had had yaws. In every case it was found that the yaws had occurred prior to the first symptom of gangosa, and that with few exceptions there exists in every gangosa family persons not afflicted with gangosa who have had yaws.

In March and April, 1911, Assistant Surgeon G. B. Crow, United States Navy, determined 100 complement fixation reactions,¹ using Emery's method, and during October and November, 1911, Assistant Surgeon E. P. Halton, United States Navy, determined a larger number of reactions,² using Noguchi's method, in gangosa and other diseases as well as in normal natives and white people (for controls). In spite of the fact that all of the gangosa patients had been taking full doses of bichloride of mercury and iodide of potassium (mixed

¹ Table of these reactions published in U. S. Naval Medical Bulletin, Vol. 5, No. 4, in an article by Surgeon H. E. Odell, U. S. Navy, entitled "Is gangosa a form of syphilis?"

² "Etiology of gangosa, based upon complement fixation." Assistant Surgeon E. P. Halton, U. S. Navy, U. S. Naval Medical Bulletin, Vol. 6, No. 2.

treatment) for about 18 months and were still under treatment, they gave the following results:

Number of cases giving a positive reaction (this number includes 10 examined by Crow and not seen by Halton)-----	154
Number of cases giving a negative reaction (of these, 20 were found to be positive by Crow in March and April)-----	120
Total number of gangosa patients in which reactions were determined -----	274

The results of other tests made are as follows:

State of subject.	Total examined.	Reaction.		Yaws.			Remarks.
		Positive.	Negative.	Yes.	No.	?	
Amoebiasis.....	1	1		¹ 1			
Abscess.....	3		3		² 1	¹ 1	
Adenitis.....	1		1		¹ 1		
Cystitis.....	2		2		² 2		
Gangosa and leprosy.....	1	1		¹ 1			
Gonorrhea.....	1	1		¹ 1			
Injuries.....	3	1		¹ 1			
Intestinal parasites.....	31	20	2	¹ 19	¹ 1		
Leprosy.....	22	18	11	¹ 15	¹ 10		
Malaria.....	1		4	¹ 1	¹ 3		
Osteomyelitis.....	1		1		² 1		
Syphilis.....	1	1			¹ 1		
Tuberculosis (hip).....	1	1			¹ 1		
Tonsillitis.....	1		1		² 1		
Yaws.....	15	15		¹ 15			
Controls.....	44	11		¹ 11			
			18		¹ 16		Yaws when infants.
			15		¹ 2		
For diagnosis.....	2	1		¹ 1	² 15		
Cases removed from gangosa list.	13	8	1	¹ 8	² 1		
			5		¹ 5		
Total number of cases examined.	144						

¹ Native.

² White.

Taking away the reactions in white people (22), we have left the reactions in natives of Guam (122). Of these 78 were positive and 14 negative. The investigation into the prevalence of yaws disclosed the fact (as shown in the above table) that of the cases giving a positive reaction 73 had had yaws, and 5, according to their history and the absence of demonstrable scars, never had had yaws (note 3 lepers whose history is questionable), while of the cases giving a negative reaction 4 had had yaws.

Dr. Howard Fox, writing in the American Journal of the Medical Sciences for May, 1911, reports the serum reactions of 60 cases of leprosy in which no history of syphilis was obtainable. His summary is as follows: Of 38 cases of the tubercular and mixed type, the reaction was negative in 7, weakly positive in 3, positive in 21, and

strongly positive in 7 cases. Of 22 maculo-anesthetic and purely anesthetic cases, the reaction was negative in 19, strongly positive in 1, and positive in 2 cases. Maj. Horace D. Bloombergh, Medical Corps, United States Army, reported, in the Military Surgeon for August, 1911, 18 cases of leprosy which gave a negative serum reaction and 3 cases which were positive (1 of these gave a clear history of syphilis of seven years' duration). With Maj. Bloombergh, the writer of this article considers it doubtful if a positive serum reaction is to be obtained as a result of infection with the bacillus lepræ, and before attributing a positive reaction in a leper to his leprosy alone it is necessary to consider the possibility not only of syphilitic taint but also of present or antecedent yaws. This latter is especially important when working with leprosy in the Tropics, where yaws is prevalent.

The conclusions which the writer draws from the above investigation are:

- (a) That yaws is exceedingly common in Guam.
- (b) That yaws is an antecedent factor in gangosa.
- (c) That yaws is responsible for the positive serum reactions which have been obtained in gangosa, leprosy, and other diseases in Guam as well as in apparently normal natives.

(d) That yaws in the different households in Guam explains the apparent family relationship which has been reported as occurring in gangosa and the positive serum reactions which have been obtained in blood relatives (brothers and sisters) of those afflicted, showing no lesions of gangosa.

In conclusion the writer wishes to express his thanks to Mr. Juan Aguon, manager of the Susana Pharmacy, United States naval hospital, Guam, for valuable assistance rendered during this investigation.

DIAGNOSIS AND DOSAGE IN HOOKWORM CASES IN THE NAVY.

By Surgeon J. F. LEYS, United States Navy.

Ninety-six cases of hookworm infection in southern-bred recruits received at the naval training station, Newport, R. I., during 1911, were treated with an unvarying method throughout the series, and with a careful record of results. The method was as follows:

EXAMINATION FOR DIAGNOSIS.

The stools examined were collected without catharsis and were, in nearly all cases, well-formed stools. No liquid was added. Three slides were spread from each specimen, each slide containing material taken with a match stick from three different parts of the specimen, sufficient to fill the area under a large ($\frac{1}{8}$ -inch) square cover

glass. Each slide was scanned throughout with the mechanical stage. Thus nine different portions of each stool came under examination, unless ova were easily found in the first or second slide. The sufficiency of this method, for all practical purposes, is accepted because (1) it proved sufficient for diagnosis in the lightest infections, a number of the cases having only 2 or 3 parasites; (2) in repeated reexaminations of a large number of negative cases the results were constantly negative; and (3) the percentage of positive results (28.5) among 337 cases from the whole South was surprisingly large when it is remembered that the individuals were recruited largely in urban communities and were all in good general health, only two of the entire number having a blood count below 4,000,000, and only 10 below 4,500,000. Fifty per cent of infections were found in individuals from two States (South Carolina and Alabama). The same method of stool examination was employed to determine absence of ova after treatment.

TREATMENT.

The drugs most in favor for hookworm are: (1) thymol, (2) beta-naphthol, and (3) a combination of oil of eucalyptus with chloroform and castor oil. This series of cases being too limited for comparisons of treatment, it was determined at the outset to adhere to one drug and to an unvaried dosage. This dosage was warranted by the facts that all the cases were between 17 and 25 years of age, none weighed less than 110 pounds, all were in fair to excellent general health, and all were treated under hospital conditions in bed and under observation and control. The dosage of thymol was the largest commonly approved, 30 grains three times at intervals of an hour, preceded and followed by 24 hours' fasting and 1 ounce of Epsom salts. Each patient thus received 90 grains of thymol within a period of two hours. The same course of treatment was given a second and a third time to every case with intervals of 10 to 15 days whether needed or not, in order that records might be uniform and complete. There were no ill effects in any case and only a few patients complained of an uncomfortable burning sensation in the abdomen. The stools were sometimes examined for ova subsequent to the first and second courses of treatment; always after the third course. All stools were saved and all parasites counted.

PARASITES EXPELLED AT EACH TREATMENT.

The total number of parasites removed from 96 patients was 4,061, or an average of 42 hookworms per patient. Of the 4,061 worms removed, the first course of treatment removed 3,585, the second course 353, the third course 116. A fourth course, required in only 3 of the patients, removed 7 worms. The average percentage of the

total number of parasites removed by each of three treatments was, therefore, ignoring fractions, first course 88 per cent, second course 9 per cent, third course 3 per cent. These figures represent a higher percentage removed by the first course of treatment than the reported general experience with smaller doses of thymol or with various remedies and varied dosage.

In 27 cases, in which the total number of worms varied from 2 to 144, all worms were expelled by the first course of treatment. In 47 other cases, in which the total number of worms varied from 2 to 406, all worms were expelled by the first and second courses of treatment. In 19 other cases, in which the number of worms varied from 2 to 467, the worms were not all expelled until after the third treatment. In the remaining 3 cases, in which the total number of worms varied from 35 to 525, the worms were not all expelled until after the fourth treatment.

Should one be called upon to treat a considerable number of persons whose age and physical condition would warrant the full dosage followed here and in circumstances where it would not be practicable to count all parasites expelled at each treatment and not practicable always to examine stools for ova before treatment is repeated, the tabulated results in this series of 96 cases indicate the following rule of practice as giving a reasonable assurance of satisfactory results:

1. Diagnosis by scanning three slides representing nine portions of a natural stool.

2. Course of treatment: First day, in bed, light liquid diet, 1 ounce Epsom salts at 10 a. m.; second day, in bed, thymol finely triturated, in capsules, grains 30 at 6, 7, and 8 a. m., 1 ounce Epsom salts at 10 a. m. Save all stools. Count parasites.

3. If 150 parasites or more are found, three more such courses of treatment are likely to be required; if 50 parasites or more, two more courses are required. If fewer than 50 parasites are found, one more course of treatment is required. Following this rule, all parasites will have been expelled in the vast majority of cases, and probably not more than one or two worms will remain in any case.

A year's experience at this station points to the importance of routine examination of stools of southern-bred enlisted men throughout the naval service. We are all accustomed to examine for intestinal parasites when engaged in practice in a locality where they are common, as at our tropical stations. We are apt to give no particular thought to the subject at other times and places. We should have in mind the views now generally accepted—that the food of the hookworm is intestinal epithelium; that it sheds the blood of the host only incidentally and in insignificant quantity; that anemia is the effect of a toxin secreted by the head glands of Looss and absorbed by the host; and that anemia results from harboring even a small number of

worms over a considerable time. How many men, enlisted in the United States in apparently good health, have been later invalided home from the Tropics for indefinite causes, neurasthenia, anemia, etc., ascribed to "effects of tropical climate," who brought from their own homes into the service and carried with them to the Tropics this cause of their subsequent invalidism? And how many such potential invalids, unrelieved of hookworm, are we carrying to-day in the Navy and Marine Corps at large?

NITROUS OXIDE-OXYGEN ANESTHESIA.

Rebreathing method of administration in general surgery.¹

By Surgeon H. F. STRINE, United States Navy, and Hospital Steward R. B. DUNCAN, United States Navy, anesthetist.

Nitrous oxide-oxygen anesthesia was introduced at this hospital in April, 1912. James H. Culpepper, M. D., of Norfolk, Va., kindly demonstrated his technique of administration, which has been followed with these exceptions: We rebreathe longer and use no ether.

ADVANTAGES OF REBREATHING METHOD OVER THE DIRECT METHOD.

1. No complicated apparatus is required.
2. There is not a continuous flow of chilling gas.
3. Practicable for the ordinary anesthetist to safely administer.
4. An inexpensive anesthetic. Average cost in 138 administrations, 41 cents.

ADVANTAGES OF GAS OVER ETHER.

1. No dread of the anesthetic, pleasant to taste and smell.
2. Rapidity and ease with which unconsciousness and recovery occur.
3. Absence of irritation to the respiratory passages and kidneys. No toxic aftereffects.
4. No mortality, except where ether would be an unjustifiable risk, as in advanced cardiac or arterial disease. Statistics on over 4,000,000 administrations in dentistry and many thousands in general surgical work have been reported without a death.

The danger signals of ether are those of a systemic poison difficult at times to recognize and correct, even by the most skilled anesthetist. Post-operative ether complications with an occasional death are not appreciated, since the anesthetist considers his responsibility ended when the patient returns to consciousness. He does not place in his mortality list deaths from lung and kidney complications. The dan-

¹ Report from the United States naval hospital, Norfolk, Va.

ger signal of nitrous oxide is cyanosis, and the immediate remedy lies in the oxygen cylinder. A death from asphyxia would be unpardonable.

DISADVANTAGES, AS POPULARLY BELIEVED, DISCUSSED.

1. **CYANOSIS.**—In the rebreathing method properly managed the patient's color is good. In our cases only three were deeply cyanosed.

2. **RIGIDITY.**—The soft muscle relaxation of ether is not obtained. Muscle tone remains, but rigidity has thus far not interfered in our work, except one gastroenterostomy, where gas was changed to ether to return the transverse colon after the clamps were placed. The appendectomies represent cases with and without abscess and adhesions, one extremely adherent between the bladder and rectum. In no case was it necessary to crosscut muscle fibers. Hemorrhoidectomies represent the smoothest cases in our series. No difficulty was encountered in dilating the sphincter in any case.

3. **VOMITING.**—Only two cases required the removal of the face mask. Each vomited once. The face mask was then replaced.

4. **ETHER NECESSARY FOR RELAXATION.**—"Gas-ether anesthesia" should be expressed "ether-gas anesthesia" is commonly heard. The opinion of three anesthetists, each covering over 3,000 administrations, was obtained. Two give ether frequently from a few drops to one-half ounce—rarely more—to secure good muscle relaxation. One stated that he rarely gives ether. In our series of cases about 20 of the first 50 cases received ether—from a few drops to one-half ounce—three received more, as noted under remarks. Convinced that ether in such small quantities interfered with regular breathing and had no effect in producing relaxation, the ether cup was detached from the apparatus, and in no case has the face mask been changed to the ether cone.

5. **MORPHINE NECESSARY.**—About two-thirds of the cases received one-sixth grain morphine sulphate one-half hour before operation. About one-half of the appendectomies received no morphine. Apparently there was no difference.

6. **EXPERT ADMINISTRATION REQUIRED.**—One administration was given at this hospital by Dr. Culpepper lasting 30 minutes; two days later gas was given to a patient with gunshot wound of the abdomen for one and one-half hours, in which less than 2 ounces of ether was used. This fact is important. An inexperienced gas anesthetist in four months gave the following administrations without receiving assistance or suggestions and has convinced quite a number of the medical officers of the service and civilian physicians that nitrous oxide-oxygen is the anesthetic of choice in the vast majority of op-

erations in general surgery. Also that anyone accustomed to give ether can safely give gas, provided he possesses sufficient self-confidence. Direct breathing requires expert work. It is responsible for the general belief that gas is impracticable where muscle relaxation is necessary. You can no more give gas-oxygen on a percentage basis than you can ether. The individuality of the patient breaks up all nicely adjusted clockwork in anesthesia. Let the patient breathe gas, and when he becomes cyanotic give oxygen until his color clears.

TECHNIQUE OF ADMINISTRATION.

The patient should have the same preparatory treatment as for ether anesthesia. The stomach should be empty. The Gatch apparatus, manufactured by the Wilms Instrument Co., of Baltimore, is used.

TO BEGIN ANESTHESIA.—Adjust the rubber cuff face mask so that it is comfortable to the patient. It must fit air tight. Adjust the valve in the valve box for "to and fro" breathing. Fill the bag with nitrous oxide gently and allow rebreathing. When the patient becomes slightly cyanosed, permit a puff of oxygen to escape into the bag. According to the individual, every 3 to 10 minutes the valve is adjusted for direct breathing, and the bag thus emptied to be refilled with fresh gas. Thus the anesthetic continues.

REPORT OF ADMINISTRATIONS.

Character of operation.	Number.	Average time (minutes).	Remarks.
Appendectomy.....	22	34	
Amputations:			
Major.....	2	35	
Minor.....	6	12	
Arthrotomy, knee joint.....	3	61	
Hernia (abdominal).....	27	23	
Gastroenterostomy.....	2	87	One case, ether after placing clamps; second case, 1 ounce of ether.
Exploratory laparotomy, splenectomy.....	1	47	
Gunshot wound of diaphragm and stomach.....	1	90	2 ounces of ether.
Osteomyelitis, femur, drainage.....	2	30	
Hydrocele.....	8	18	
Varicocele.....	16	13	
Varix.....	6	28	
Pleural cavity drained.....	2	26	
Exploratory laparotomy.....	1	30	
Fracture, plated.....	1	35	
Hemorrhoidectomy.....	18	12	
Castration.....	1	17	
Miscellaneous.....	19	12	
Total administrations.....	138	.....

"Average time" means time from starting gas to removing mask. Longest administration, without a drop of ether, 75 minutes.

A THEORETICAL DISCUSSION OF THE CHARACTER AND GENESIS OF THERMIC MYOSPASMS, WITH FURTHER OBSERVATIONS ON MYALGIA THERMICA.

By Passed Assistant Surgeon W. L. MANN, United States Navy.

In a previous article¹⁹ I presented some results of observations on a series of about 100 cases of heat cramps, suggesting a tentative classification according to symptoms of the effects of high temperature on the human system, and calling attention to the presence of an undetermined pathogenic factor in the production of heat cramps, which factor appeared to be of microbic causation. At our present state of knowledge concerning this obscure yet important pathological condition, any further remarks will necessarily include certain assumptions, dogmatic assertions, and analogical conclusions. Consequently liberal use will be made in this article of the qualifying term "theoretical."

First, it will be assumed for the sake of discussion that siriasis and myalgia thermica are closely allied conditions, since the reported epidemic incidence and certain similar symptoms, together with high temperature as an etiological factor, suggest a similarity.

The myospasms observed aboard this ship were divisible into local and general. The local type was often unilateral, more permanent, tending to affect muscles most employed, and, as a rule, was first noticed in the fireroom; whereas the general type was more severe, tended to be bilateral and evanescent in character, and seemed to be neurogenic. This classification was not sharply defined, but was made in an attempt to resolve the subject into more simple matter for discussion and not in an endeavor, as may later appear to some, to make facts accord with theories. To further substantiate this classification, it may be mentioned, as I later discovered, that Edsall intimates the same when he says "the conditions all point to disorder of the muscles" (local type), but he goes on to state, "in a few cases described to me there has been direct signs of coincident spinal involvement" (general type).

GENERAL TYPE OF MYOSPASMS.

It has been observed that cold drafts, cold baths, and other sensory stimuli may precipitate an attack of general spasms, in an analogous manner, as they do in strychnine poisoning. Consequently it is now presumed that the myospasms are caused by the action of some stimulus increasing the reflex excitability of the spinal cord. The reported uremic odor, dryness of the skin, convulsions, and urinary findings indicate that this stimulus may be an autogenous toxin, produced by delayed, defective, or perverted metabolism. On the other hand, the marked epidemic genesis and the similarity to the cramps

of cholera suggests that this toxin may be directly or indirectly due to a micro-organism. Furthermore, as all cases were exposed to conditions that favored the production and evaporation of large quantities of perspiration, it is assumed that the deficient serosity of the blood is one of the causative factors in this complex etiology, possibly a combination of the above.

LOCAL TYPE OF MYOSPASMS.

But would the assumed action of this toxin, either microbic or autogenous, increasing the reflex activity of the spinal cord, explain the unilateral type and the tendency to affect muscles most employed? Granted that the general class of cramps are simple muscular contractions due to the increased excitability of the spinal cord, what is the genesis and character of the local type, myogenic or neurogenic, simple muscular contractions or thermic rigidity due to the coagulation of the muscle plasma by the direct action of the heat? At this time it would be digressing too far into hypothetical territory to continue the discussion of this subject in detail, and until the collection of data and of more elaborate clinical investigation and laboratory research is accomplished it suffices to apply some of the results of experimentation on other rigidities to this clinical phenomenon.

To H. C Wood⁴ must be acknowledged the credit of the compilation of much of the following data. McKay was the first to show that if the circulation of the limb was cut off by a ligature the muscles may become rigid and fail to react to galvanism, and when the circulation is restored the muscles assume their contractility and pliability. But Brown-Sequard and Stannius went further. They found if the ligature is left long enough that the muscle can not be restored to normal by the removal of the ligature, i. e., the first rigidities seem to gradually pass into post-mortem rigidity. Now, if the first rigidity was vital phenomena, i. e., a simple muscular contraction, the muscles should relax as soon as dead, which did not happen. Granted the above hypothesis, Wood concludes "thermic and post-mortem rigidity are alike due to coagulation of a plasma in the muscles." But we must not forget that he was dealing with rigidity produced experimentally, so before drawing any definite conclusions the identity of the muscular cramps seen on board ship and this rigidity must be proved.

Continuing the discussion of the possibility that certain of the local cramps may be due to the coagulation of the muscle plasma, it has been demonstrated that overexertion of the muscle fibers makes the myosin prone to earlier coagulation. This was first shown by Harless, who found that the muscles of a normal rabbit coagulate at about 118° F., but in a tetanized animal the coagulation took place

at about 107° F. Furthermore, this coagulation of the muscles does not imply the death of muscle fiber, as demonstrated by Stannius. So it may be possible that the extreme overexertion of the muscles of the fireroom force, with delayed elimination of the katabolic products, causes a gradual accumulation of substances in the muscles, which will perhaps cause thermic coagulation at only a few degrees above blood temperature. And as the fireroom temperature varied from 115° to 189° F. the flesh was exposed, during periods of cessation of perspiration, of which many cases complained, directly to sufficient heat to cause coagulation of the unprotected muscle plasma *in vitro*. It has also been shown that some muscles may coagulate at a temperature of 113° F., while blood and nerves are little affected by a temperature of 115° F. Consequently it is conceivable and the results of experimentation suggest that certain unilateral cases of cramps affecting the muscle most employed (e. g., seven cases of cramps in the right forearm among those using the slice bar) may be due to a *coagulation of the muscle plasma* and not a simple muscle contraction. Furthermore, the ability of muscles to clot and unclot "in vitro" is in accord with this possibility. The amount of force necessary to overcome the muscular spasms likewise suggests that they are not simple muscular contractions.

MISCELLANEOUS COLLECTION OF DATA.

The following data may be of some value in the study of heat cramps. Early experiments by Vallin tended to prove that death from high temperatures is due to coagulation of the cardiac muscle, while later observers believe this is rare, and that death is usually due to a type of asphyxia. This may explain the one reported death due to heat cramps. One observer^{5,6} finds there is absence of chlorides in the urine for some days after heat cramps, "followed by a free output"; also there is loss of nitrogen, phosphorus, and sulphur in the urine Chvostek's^{7,8}, Trousseau's, Hoffman's, and Babinski's phenomena are reported absent in heat cramps, and the affected muscles are said to show increased excitability to the faradic current. Sensation of pain, touch, and temperature are normal. Thermic rigidity produced experimentally shows acidity and fails to react to galvanism.

Welsh² finds that the flexors of the fingers are first involved in heat cramps; he also reports that chronic alcoholism does not seem a predisposing factor Fleming¹ has made some interesting observations on the effect of dry heat. He found the urea was increased and the chlorides were lessened in the urine, but the quantity of chlorides in the sweat was increased to 6.05 parts per 1,000, thus probably accounting for absence of chlorides in urine of some cramp cases. The pulse rate, body temperature, and arterial tension were

first increased by the heat, but after excessive duration of exposure these were diminished. The respirations were first lessened in rapidity and later increased, but maintained a diminished ratio to the pulse.

One author states that the cramps are probably due to an acute degenerative process in the muscles. Several observers^{19,20} note the absence of thermal disturbances.

SUGGESTIONS AND CONCLUSIONS.

Man, of all homothermic animals, has the greatest power of adapting himself to wide variations of meteorological conditions, yet in the closed fireroom system of forced draft as used on some vessels the limit of this adaptability is attained and even exceeded. As a rule all hygienic and sanitary considerations are naturally subsequent and secondary to mechanical improvements. The time has now arrived that the firerooms of naval vessels should be given close study from a sanitary standpoint, so that in the future the designs of the firerooms, coal bunkers, and engine room should be so arranged as to reduce the unhygienic conditions to a minimum without causing any impairment to the mechanical efficiency. My brief experience in the service leads me to suggest that alteration in the location and direction of the forced draft, as used on the armored cruisers, would prevent the necessity of the men laboring directly under the air blast, and likewise might obviate the space of overheated air above the blowers.

The speed of a ship has proven next in importance to ordnance and armament in modern battle-action conditions. For this speed forced draft is essential. But it would appear that under present conditions on certain vessels the prolonged use of forced draft might so disturb the morale, as well as the physical equilibrium, of the fireroom force as to lead to failure in that crucial moment and supreme test of all naval efficiency, namely, battle-action conditions.

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820 COMPLEMENT-FIXATION TESTS ON 461 PATIENTS—MODIFIED EMERY TECHNIQUE.¹

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During the past eight months (from November 21, 1911, to August 1, 1912, inclusive) 820 serum tests have been made in the laboratory of the United States naval hospital, New York, on a total of 461 patients. These included normal controls, patients with nonspecific maladies, and syphilitics with both doubtful and manifest lesions. Carefully tabulated records of the findings have been kept, both for the purpose of determining the reliability of the modification as employed at this hospital and, in conjunction with the administration of salvarsan, to ascertain the effect of specific treatment upon the serum reaction. We have also endeavored to determine, if possible, the value of the test as a therapeutic indicator both in doubtful cases and in those with undoubted lesions but of varying stages of the disease and grades of severity.

In a large percentage of the cases quantitative tests have been employed, as it is our belief that by this means alone can the effect of treatment be judged with any degree of accuracy and the prognosis and therapeutic indications reached.

METHOD EMPLOYED.

It is hoped that a subsequent article may deal more fully with the technique employed, but in order to explain our methods of recording results it may be stated in brief that human complement has been used exclusively and that the amboceptor has been supplied by the serum of rabbits immunized against human red cells. The technique, as employed in the earlier tests of this series, was based on that suggested by Emery in the *London Lancet* of September 3, 1910, and March 4, 1911, although the quantitative feature of our test has been worked out independently of the latter article. During the past

¹ Report from United States naval hospital, New York.

six months the original technique has been considerably modified, an effort having been made to render the results of the test more constant with reagents of varying strength; to simplify it as regards apparatus and time for its performance; and, finally, to devise a method which would be applicable on board ship. It will be readily appreciated that any such method must eliminate the necessity on shipboard for animals, the preparation of reagents, and the use of a high-powered centrifuge, which has heretofore been a necessity for accurate blood work.

The quantitative feature of the method employed depends upon the fact, as pointed out by Morgenroth and Sachs,¹ in connection with complement and amboceptor, that the quantity of any one of the five factors entering into the complement-fixation reaction varies inversely as the quantity of its specific antagonist present in the reagent to be tested. So that, knowing the quantitative value of any one or more of the factors, we are able to determine the presence and quantity of any other, unknown, factor with a very fair degree of accuracy. Thus, Noguchi,² with fixed volumes of red cells, complement (guinea pig's), amboceptor, and antigen, determines the strength of reaction by using varying quantities of patient's serum (syphilitic antibodies); while the method we have employed accomplishes the same end by using fixed volumes of red cells, complement (as furnished by patient's serum), and amboceptor, and determines the strength of syphilitic antibodies in a fixed volume of patient's serum by employing varying quantities of a standard antigen. As can be readily seen, the end is exactly the same, with simplicity of technique in favor of the latter method, owing to the greater care in making the dilutions of antigen and in avoiding the use of foreign complement.

Noguchi's³ principal objections to the use of native human complement are: (1) Old serum and spinal fluid can not be tested, owing to the rapid deterioration of complement. (We have with entire satisfaction supplied the complement by adding fresh normal human serum.) (2) Human sera contain varying amounts of complement. (We have not found this a confusing factor in a single one of the quantitative reactions herein reported.) (3) The comparatively smaller amount of complement available in human serum necessitates a much greater amount of amboceptor than is required when foreign complement is used. (The expense of serum is quite negligible, as in our 820 tests the serum of but four rabbits has been required, owing to the small volume used; and this at an expense of only \$4, the initial cost of the animals.)

¹ Morgenroth and Sachs, in Ehrlich's "Gesammelte Arbeiten," etc., Berlin, 1904.

² Noguchi, Interstate Medical Journal, Vol. XVII, No. 1.

³ Noguchi, Proceedings of the Society for Experimental Biology and Medicine, 1909, Vol. VI, pp. 77-81.

METHOD OF RECORDING RESULTS.

Our method of recording results is original, so far as we know, and by it we attempt to represent the actual amount of syphilitic antibody present in a given volume of serum by indicating the minimum quantity of a standardized antigen required to give complete fixation of complement. The result of a given test is recorded as a fraction, the denominator of which indicates the actual quantity of antigen required as compared with the volume of serum entering into the reaction, while the numerator represents the degree of hemolysis. We have adhered to the negative ($-$), doubtful (\pm), and positive ($+$) reactions in recording results, but for closer reading we have further subdivided these findings into the following six classes: Negative ($-$), when hemolysis is wholly complete; doubtfully negative ($-?$), when a very few cells remain undissolved at the end of the secondary incubation; doubtfully positive ($+?$), when still more of the cells remain undissolved, but with no apparent difference in color of the fluid from the control tube; weakly positive ($+$), when a slight difference in color is apparent in the two tubes; positive ($++$), when only the faintest trace of hemolysis is apparent in the test tube; and strongly positive ($+++$), when complement fixation is complete. Some question has arisen in our minds as to the advisability of making the distinction between negative and doubtful reactions; but in view of the behavior of undoubted syphilitics in their progress to a negative reaction under the influence of treatment it has been deemed advisable to retain the present classification.

The denominator employed with any sign below $+++$ indicates the greatest quantity of antigen which can be used without itself absorbing complement, while any denominator used with $+++$ indicates the minimum quantity necessary to produce complete fixation. It has been found advisable to make the degrees of dilution as small as possible in order to obtain a close reading; e. g., with the antigen in use at present the greatest working quantity is 3 (i. e., one-third volume of antigen), from which the quantities decrease in the following order, 4, 5, 7.5, 10, 15, 20, 30, 40, 60, etc. the strongest reaction noted giving a fraction of $\frac{+++}{160}$ i. e., there was complete absorption with a quantity of antigen no greater than one one hundred and sixtieth of the volume of serum used in the test. Using these quantities it is found that the limit of absorption extends over about three steps in the series; e. g. a case of moderate severity will result as follows: $\frac{+++}{10}$, $\frac{++}{15}$, $\frac{+}{20}$, $\frac{-}{30}$, thus indicating very closely the minimum quantity of antigen necessary for complete absorption of complement.

A card index has been made of all cases examined. The two sides of a special card designed for cases receiving salvarsan are

shown below, and by means of these we have very easily recorded correlated data of both serum tests and treatment. An endeavor has been made to precede each injection of salvarsan by a serum test and to follow the treatment after a short interval by a second test. When practicable subsequent tests have been made at stated intervals in order to note the period over which the treatment has continued to be beneficial and also to indicate relapses, as it has been noted that in many instances an increasing reaction would indicate a relapse long before the symptoms gave any evidence of the change.

[One side of card referred to above.]

Name, R——, G. R. Rate, Lds. El. Age, 20. Class, E'. Case No. 346.
 DIAGNOSIS; syphilis. PAST DIAGNOSIS; chancroid.
 DATE OF APPEARANCE OF INITIAL LESION; May 30, 1912 ADMITTED; June 4, 1912. DISCHARGED; July 12, 1912.
 DURATION OF DISEASE; 6 days. PROPHYLAXIS No. —. DAYS IN HOSPITAL; 38.

HISTORY OF CASE AND PREVIOUS TREATMENT.

Initial lesion on corona, unhealed on admission. Treponema have been found by india-ink method. Marked inguinal glands and slight general enlargement. A mixed infection. Knows the exposure was on May 4. Has had only local treatment prior to admission.

Salvarsan data.

Date.	Dose.	Site.	Method.	Chill.	Temperature.	Vomit- ing.	Purg- ing.	Eruption.	Remarks.
1912.									
June 20	0.6	L. arm..	Needle..	0	{ 102.2 1-6-10 }	5	4	Faint mac....	Slight headache.
July 10	0.6	..do....	..do....	0	{ 101 1-6-9 }	4	5	None.....	

[Reverse of card shown above.]

Date.	Initial lesion.	Glands.	Erup- tion.	Muc. patch.	Trep.	Other les.	Wass.	Treat.	Remarks.
1912.									
June 6	{ Unhealed pe- nis.	Inguinal slt. gen.	0	0	{ Many chanc.	0	-? 3	Local.	Mixed infection.
10	..do....	..do....	0	0	—	0	+	..do..	
13	..do....	..do....	0	0	Many.	0	+	..do..	
17	{ More indu- rated.	{ Larger.....	0	0	—	0	++	..do..	
20	..do....	..do....	0	0	—	0	+++	606....	Severe reaction
21	More inflamed	..do....	(¹)	0	—	0	+++ 4	Mixed	
26	Healing.....	No change....	0	0	—	0	+++ 3	..do..	
July 3	Healed .....	..do....	0	0	—	0	+++ 3	..do..	
10	..do....	{ Inguinal smaller.	0	0	—	0	++ 3	606....	Severe reaction.
12	..do....	..do....	0	0	—	0	+++	Mixed	To duty.
Aug. 1	..do....	All gl. smaller.	0	0	—	0	++ 3	..do..	

¹ Very faint macular.

CLASSIFICATION OF CASES.

For purposes of classification the cases have been divided into six groups, according to the nature of the disease and severity of symptoms. These represent both treated and untreated cases of syphilis, and cases with manifest lesions as well as those with no apparent lesions but which were discovered during the routine serum examination of the ward patients of this hospital.

TABLE I.

CLASS A.—NORMAL CONTROLS AND NONSPECIFIC CASES.

	Number of cases.	Negative.		Doubtful.		Positive.	
		—	— ?	+ ?	+	++	+++
Abscessus	1	1					
Acne	1				1		
Adenitis inguinalis	2	2					
Adenitis salivosa	1				1		
Adenoids	1		1				
Adenoma (left temple)	1		1				
Adhesio-abdominalis	1			1			
Ambustio ex calore	1			1			
Angina pectoris	1				1		
Ani prolapsio	1	1					
Ankylosis (left knee)	1				1		
Appendicitis	12	3	4	4	1		
Arterio-sclerosis	1		1				
Arthritis (left knee)	1		1				
Arthritis (left middle finger)	1			1			
Arthritis (right knee)	1	1					
Arthritis (spinal)	1			1			
Arthritis gonorrhoeica	6	3	1	2			
Bronchitis acuta	2		2				
Bronchitis chronica	2		1	1			
Bursitis (right metatarsal)	1		1				
Cart. intra-art. dislocatio	2		1		1		
Cataracta (traumatic)	1			1			
Catarrhus epidemicus	1		1				
Catarrhus intestinalis acutus	1	1					
Chancroid	2	1	1				
Cholangitis	1			1			
Cholecystitis	2		1	1			
Chondroma	1		1				
Clavus	1		1				
Constipatio	1			1			
Cystitis	2	1	1				
Deformitas	5	2		3			
Dementia (senile)	1	1					
Epilepsia	3		1	2			
Febris cerebro-spinalis	1		1				
Febris pneumonica	1		1				
Febris rheumatica	6	4	1	1			
Febris typhoides	3	3					
Fistula in ano	2	1			1		
Fractura	8	5	1	1	1		
Gonorrhea	10	3	6	1			
Hemorrhoids	1		1				
Hepatitis suppurativa	1		1				
Hernia	9	1	5	2		1	
Herpes (progenitalis)	1		1				
Hypertrophia tonsillaris	1			1			
Insania manic-deprimens	3	1	1	1			
Lymphadenitis (right axilla)	1	1					
Malaria (febris tertiana)	1		1				
Mastoiditis	2	1		1			
Membri clades	1		1				
Monoplegia (right arm—traumatic)	1	1					
Morbilli	1		1				
Myalgia acuta	1	1					
Myalgia chronica	2	1	1				
Myocarditis	1	1					
Myopia	1			1			
Nephritis acuta	2		2				
Nephritis chronica	3		2	1			

CLASS A.—NORMAL CONTROLS AND NONSPECIFIC CASES—Continued.

	Num- ber of cases.	Negative.		Doubtful.		Positive.	
		—	— ?	+ ?	+	++	+++
Neuralgia (post-orbital).....	1	1					
Orchitis (gonorrheal).....	3	2	1				
Otitis media.....	2		2				
Paranoia.....	1			1			
Periostitis.....	2	1	1				
Pes planus.....	2		2				
Pleuritis acuta.....	3		2	1			
Pleuritis purulenta.....	1			1			
Pyelitis.....	1	1					
Retinitis.....	1		1				
Scabies.....	3	1	2				
Scarlatina.....	4	1	2		1		
Stemma.....	4		3	1			
Stomatitis.....	1	1					
Surditas.....	2	2					
Synovitis (knees).....	1			1			
Tonsillitis.....	2		1	1			
Tuberculosis pneumonia.....	2	2					
Ulcus (left heel).....	1	1					
Unguis involutus.....	1		1				
Varicocele.....	1		1				
Varix.....	3	2			1		
Venenum neuroticum.....	2	2					
Vertigo.....	1			1			
Viscera ruptio (left kidney).....	1			1			
Vulnus infectum.....	1	1					
Vulnus laceratum.....	3	1		1	1		
Vulnus sclopeticum.....	1			1			
Normal controls.....	9	8	1				
Total.....	188	68	68	40	11	1	

CLASS B.—LESIONS OF A DOUBTFUL NATURE, BUT WITH A NEGATIVE HISTORY OF SYPHILIS.

Adenitis inguinalis.....	1	1					
Appendicitis.....	2	1			1		
Cholecystitis.....	1	1					
Dementia.....	1						1
Fractura.....	2	1	1				
Hepatitis acuta.....	1	1					
Leptomeningitis (spinal).....	1				1		
Syphilis.....	15		6	5	3	1	
Total.....	24	5	7	5	5	1	1

CLASS C.—LESIONS OF A SUSPICIOUS NATURE WITH AN INDEFINITE HISTORY OF SYPHILIS.

Adenitis inguinalis.....	5	4	1				
Arthritis gonorrhoea.....	3			1	1		1
Catarrhus gastricus chronicus.....	1			1			
Chaneroid.....	4	1	2	1			
Choroiditis.....	1		1				
Deformitas.....	1					1	
Dementia.....	1					1	
Diphtheria.....	1		1				
Eczema.....	1				1		
Emphysema pulmonalis.....	1					1	
Enteritis.....	1					1	
Enuresis.....	1		1				
Febris pneumonica.....	1			1			
Febris typhoides.....	1				1		
Fractura.....	1					1	
Gonorrhea.....	6	2		1	2	1	
Hemiplegia.....	2		1			1	
Insania manic-deprimens.....	3	1			2		
Laryngitis chronica.....	1						1
Lupus.....	1						1
Lymphadenitis.....	1					1	
Monoplegia (right leg).....	1					1	
Myopia.....	1	1					
Neuritis (left occipital).....	1	1					
Orchitis.....	1		1				

CLASS C.—LESIONS OF A SUSPICIOUS NATURE WITH AN INDEFINITE HISTORY OF SYPHILIS—Continued.

	Num- ber of cases.	Negative.		Doubtful.		Positive.	
		—	?	+ ?	+	++	+++
Periostitis (right tibia).....	1						1
Pharyngitis.....	1	1					
Pterygium.....	1						1
Scabies.....	1			1			
Scarlatina.....	1					1	
Sclerosis spinalis posterior.....	1				1		
Syphilis.....	5			2	2	1	
Trichophytosis.....	1				1		
Tuberculosis pneumonica.....	1	1					
Ulous (right foot).....	1	1					
Varix.....	1					1	
Vulnus laceratum.....	1			1			
Total.....	58	13	8	9	11	12	5

CLASS D.—NO LESIONS, BUT A DEFINITE HISTORY OF SYPHILIS.

Adenitis inguinalis.....	6		2	2	1	1	
Asthma.....	1					1	
Catarrhus gastricus chronicus.....	2					1	
Chancroid.....	5	1	3				1
Cholecystitis.....	1						1
Cornea ulcer.....	1		1				
Deformitas (right hand).....	1	1					
Dementia.....	2					1	1
Eczema.....	1	1					
Epithelioma.....	1						1
Laryngitis chronica.....	1			1			
Myalgia chronica.....	1						1
Nephritis acuta.....	1						1
Neurasthenia.....	1						1
Syphilis.....	14		3	5	2	4	
Tuberculosis pneumonica.....	1	1					
Total.....	40	4	10	8	3	8	7

CLASS E.—HEALED LESIONS WITH A DEFINITE HISTORY OF SYPHILIS (NONINFECTIVE CASES).

Adenitis inguinalis.....	1						1
Arthritis gonorrhoeica.....	1						1
Dementia.....	1						1
Febris typhoides.....	1					1	
Fractura.....	2						2
Gonorrhea.....	1	1					
Hemorrhoid.....	1					1	
Hernia.....	2						2
Neuritis optica.....	1						1
Osteitis.....	1						1
Rhinitis chronica.....	1						1
Syphilis.....	57	2	1	4	13	17	20
Tuberculosis pneumonica.....	2			1	1		
Total.....	72	3	1	5	14	19	30

CLASS E'—OPEN LESIONS WITH A DEFINITE HISTORY OF SYPHILIS (INFECTIVE CASES).

Laryngitis chronica.....	1						1
Tuberculosis pneumonica.....	1						1
Syphilis.....	77				1	14	62
Total.....	79				1	14	64

Table I shows in detail the character of disease and number of cases tested in each class and the strength of reactions. It will be apparent that many of the cases of undoubted syphilis are entered

under other diagnoses, these being the diagnoses under which the patient was admitted to the hospital. Table II shows in tabular form the number of cases and percentage of reaction in each class, while Chart I shows graphically the percentage of positive, doubtful, and negative reactions in the six groups of cases.

TABLE II.

Class.	Num- ber of cases		Negative.				Doubtful.				Positive.			
			-	- ?	Total.	Per cent.	+ ?	+	Total.	Per cent.	++	+++	Total.	Per cent.
A.....	188	68	68		136	72.34+	40	11	51	27.12+	1		1	0.53+
B.....	24	5	7		12	50.00	5	5	10	41.66+	1		2	8.33+
C.....	58	13	8		21	36.20+	9	11	20	34.48+	12	5	17	29.31+
D.....	40	4	10		14	35.00	8	3	11	27.5	8	7	15	37.5
E.....	72	3	1		4	5.55+	5	14	19	26.38+	19	30	49	68.05+
F.....	79						² 1		1	1.26+	14	64	78	98.73+
Total.....	461	93	94		187	40.56+	67	45	112	24.29+	55	107	162	35.14+

¹ Heredity not eliminated.

² Recent infection of less than one month.

EFFECTS OF SALVARSAN ON THE SERUM REACTION.

In a large percentage of cases with a decidedly positive serum reaction the test is found to become more positive immediately after the administration of salvarsan,¹ this being noted in a few cases as early as the first day following treatment. Within a week the severity of the reaction begins to decline and then falls more or less rapidly until the end of the beneficial period is reached. This rise is presumably due to the increased liberation of toxins from the bodies of dead treponema and the secondary liberation of the "specific antibodies" from the body tissues. These antibodies are largely oxidized or eliminated after a week, which, with the decreased production, causes a consequent drop in the severity of reaction. The rise and fall in the serum reaction is coincident with the change in the lesions, the exacerbation in the symptoms following treatment with salvarsan corresponding with the increasing strength of reaction and the rapid healing of lesions (within a week) corresponding with the fall in reaction.

THE TIME OF APPEARANCE AND DISAPPEARANCE OF THE SERUM REACTION.

Two of our cases are particularly instructive in that they show the earliest period noted in this series in which the serum reaction becomes positive following the infection. Upon authoritative information these two cases were admitted to the hospital on the sixth day following the onset of sore, and at this time the reaction was negative. In one case on the tenth day and in the other on the thir-

¹ All the cases reported in this series were started on mixed treatment the day following salvarsan, but the effect, if any, of the mercurial on the serum reaction during the short time the patients were kept under observation can be wholly disregarded.

teenth day the reaction had become positive, and the highest point reached in both cases was on the twenty-first day, one day after the administration of salvarsan. These and several other early cases have led to the conviction that, given a case with suspicious lesions, a diagnosis can be made as early as the seventh day after onset by noting a reaction of increasing strength, even though it is still within the negative or doubtful class.

The date of disappearance of the reaction is necessarily much more indefinite owing to treatment and other factors, and a negative reaction with a positive history is therefore not of much assistance in

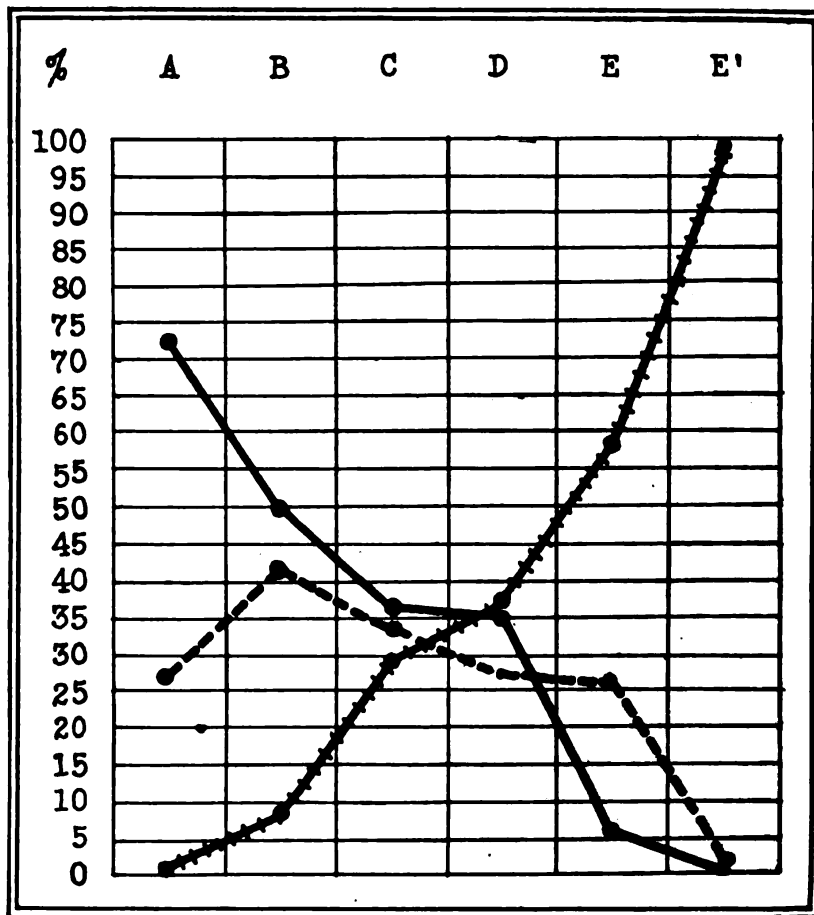


CHART I.—Solid line indicates per cent of negative reactions. Broken line indicates doubtful reactions. Crossed line indicates positive reactions.

clearing up the diagnosis. In one case of the series (No. 342), suffering from tabes and with no signs but a history of untreated infection of about 24 years duration, the reaction was doubtful and remained so after the administration of salvarsan, while in a second case suffering from epithelioma, but with no other signs of an untreated infection of about 20 years duration, the reaction was strongly positive. In the latter case, however, the reaction dropped after the

administration of salvarsan and there was a marked local reaction in the epithelioma.

PERIOD OF MOST INTENSE REACTION.

As might be expected, the secondary cases showing the most active and extensive lesions give the strongest serum reactions. This, roughly, is during the first eight months of the disease, beginning about one month after the onset. This is represented graphically by Chart II and is arranged chronologically from the dates of strongest

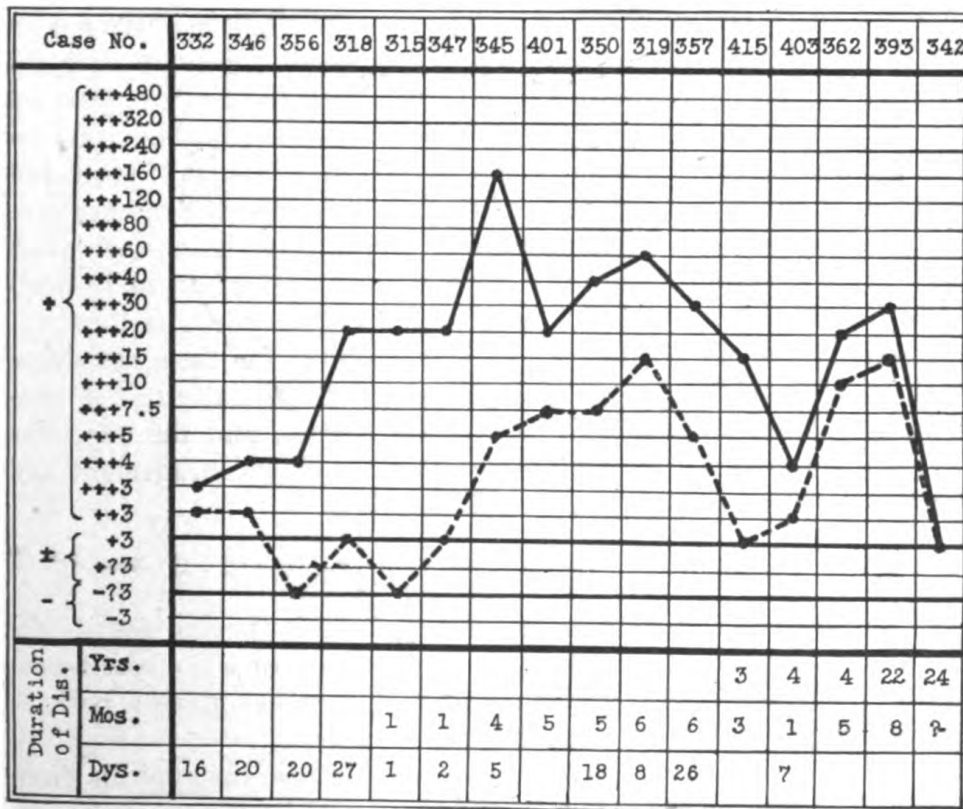


CHART II.—Solid line indicates strongest reaction noted in each case. Broken line indicates weakest reaction after treatment with salvarsan. Case 403 received mercurial treatment for about one year after infection. Cases 345, 401, and 362 received mercurial treatment for very short periods. All other cases had no specific treatment prior to admission.

reactions. The upper and unbroken line in this chart represents the highest points reached by the test prior to the treatment, while the lower, broken line represents the drop in reaction after treatment—usually two doses of salvarsan at intervals of about three weeks. This chart also indicates another point which has been suggested by a study of this series of tests, and that is that the most favorable period for treatment is within the first few months after the onset of the disease—the earlier the better. It will be noted in the chart that

in the first seven cases, although the reaction is high, the drop is much greater than in the cases of longer duration. The explanation of this is not quite clear, but it evidently depends either upon the greater vulnerability of the infecting organisms, or, what is more probable, the succulent nature of the newly formed lymphoid inflammatory tissue, from which the treponema are more easily dislodged by the circulating specific. As the cases progress in the chart it will be noted that the intervals between the maximum and minimum reactions become progressively less, although the strength of reactions gradually decreases. This is borne out by the clinical course, as the benefit from treatment in the older cases is very slight compared with that in the more recent infections. These results disagree with the teaching of the older writers¹ as to the harmlessness of delaying treatment until the secondary symptoms are well established and confirm the findings of the more recent investigators²—that if treatment is begun before the appearance of secondary lesions the disease generally runs a milder and shorter course and tertiary lesions are much less likely to occur. Hence the distinct advantage of an early diagnosis, before the onset of the dangerous open secondary lesions.

Credit is due the entire staff of this hospital for their assistance in the performance of this series of tests, and especially to the commanding officer, Medical Director J. C. Byrnes, and the executive surgeon, Surgeon C. M. Oman, for their kind encouragement and ready provision of opportunity and materials.

CONCLUSIONS.

1. The complement-fixation test for syphilis is specific despite the fact that its reaction depends upon the presence of a nonspecific entity. So far as observed by us no other disease has given a positive reaction nor a uniformly doubtful one.
2. The reaction furnishes the most reliable test for syphilis from a period a week or two after the onset of the disease until the disappearance of manifest lesions.
3. The quantitative serum reaction is the only test of value in showing the result of treatment, and relapses may be more quickly indicated by it than by a study of the clinical signs.
4. The method as employed in this hospital is not only reliable, but is simple in technique and can with little modification be made use of on board ship.
5. In untreated cases of syphilis the most intense reactions are observed within the first eight months of the disease, while the first few weeks and the post-syphilitic states may show a negative reaction.

¹ Taylor, *Genito Urinary and Venereal Diseases*, Third Ed., p. 670.

² Johns Hopkins Hospital Bulletin, Dec., 1908, p. 364.

6. The most favorable period for salvarsan treatment is within the first three months after the onset of disease, as during this time there is no dense hyperplastic tissue and the infecting organisms are evidently more easily reached and destroyed by the circulating treponemacide.

7. With the easy finding of treponema in initial sores prior to the appearance of a positive serum reaction and with the luetin test in the later stages and post-syphilitic states no case of uncured syphilis should go undiagnosed at the present time, regardless of the stage of disease, while to postpone treatment pending the development of active lesions is not only unscientific, but, considering the welfare of the patient and his associates, little less than criminal.

U. S. NAVAL MEDICAL SCHOOL LABORATORIES.

Additions to the helminthological collection, United States Naval Medical School, June-August, 1912.

Accession No.	Name.	Host.	Collected by or received from—
19855	Nematodes		Dr. W. M. Kerr, Guam.
19856	<i>Trichinella spiralis</i>	White rat	L. Avery, Naval Medical School.
19857	<i>Hymenolepis diminuta</i>	do.	Do.
19858	<i>Hymenolepis diminuta</i> (ova)	do.	Do.

Additions to pathological collection, United States Naval Medical School, June-August, 1912.

Accession No.	Tissue.	Diagnosis.	Collected by or received from—
782	Blood	Aestivo-autumnal schizont-macrogamete.	Dr. Stuart, naval hospital, Norfolk, Va.
783	.....do.....	Tertian malaria (benign).	Dr. G. F. Clark, Naval Medical School.
786	Embryo	From gangosa patient...	Dr. W. M. Kerr, Guam.
787	Eye	Cataract	Do.
788	Miliary tubercle of heart		Do.
789	Tumor from abdomen of still-born child.		Do.
791	Tumor	Fibroma	Dr. P. S. Rossiter, naval hospital, Puget Sound, Wash.
793	Testicle		Drs. Brown and Mann, naval hospital, Port Royal, S. C.
794	Vesical calculus		Dr. F. W. F. Wieber, navy yard, Boston, Mass.
795	Small calculus		Dr. Wieber, navy yard, Boston, Mass.
796	Growth from neck	Lympho-sarcoma	Dr. Higgins, naval hospital, Washington, D. C.
798	Blood	Aestivo-autumnal schizonts.	Dr. Stuart, naval hospital, Norfolk.
800	Tumor from arm	Lipoma	Dr. P. S. Rossiter, naval hospital, Puget Sound.
801	Carcinoma of stomach and carcinomatous growth of large omentum.		Dr. G. D. Hale, naval hospital, Las Animas, Col.
802	Cystic right kidney		Do.
803	Ear	Epithelioma	Dr. C. M. Oman, naval hospital, New York.
804	Gland from neck		Dr. R. Spear, naval hospital, Washington, D. C.

Additions to the miscellaneous collection, United States Naval Medical School, June-August, 1912.

Accession No.	Name.	Locality.	Collected by or received from—
33	Four-legged chicken	Guam	Dr. W. M. Kerr
34	Prairie rattler	Colorado	Dr. Stalnaker.

SUGGESTED DEVICES.

A SIMPLE METHOD OF SECURING SHELF-BOTTLE STOPPERS DURING TARGET PRACTICE.

By Hospital Apprentice, First Class, H. S. COOMBS, United States Navy.

During target practice with guns of large caliber, one difficulty that must be met is the proper protection of dispensary furniture, and this applies particularly to the shelf bottle.

At present the racks holding these bottles are so constructed of metal and so attached to the bulkheads that rigidity is largely overcome and they are protected from the direct concussion, but the jar is so great that the glass stoppers are frequently lifted free of the neck and fall upon the bottle below, leading to unsightly chipping and even unserviceability.

To overcome this fault it has been the custom to remove the glass stoppers just before firing, but this method is open to the objection that the stoppers become mixed and are not replaced in the bottles to which they properly belong. Further, the process of tying down each individual stopper is laborious and consumes a great deal of time, both in application and removal.

The following method I have found simple and most satisfactory, as it is easily applied and readily removed and permits the stopper to rise in the neck of the bottle with each concussion, but prevents it from coming out entirely.

A piece of cord is attached to one end of the rack, a turn is taken around each stopper in turn until the opposite end of the rack is reached, when the cord is again secured. Each row of bottles is treated separately in the same way.

THE RAT GUARD USED IN THE PHILIPPINE ISLANDS.¹

This rat guard is patterned after the combined ideas of several of the officers of the United States quarantine service in the Philippine Islands and is an effective barrier to the passage of rats, is cheap.

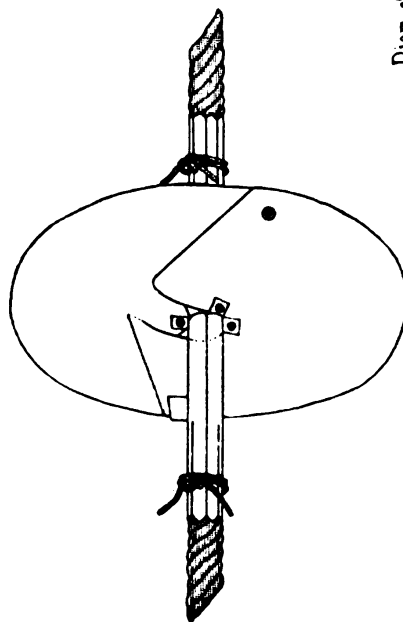
¹ The original from which this description is taken appeared in the June 7, 1912, number of the Public Health Reports, entitled, "The rat guard used in the Philippine Islands, by Carroll Fox, passed assistant surgeon, Public Health and Marine-Hospital Service."

readily applied, light, and not easily made unserviceable by hard usage.

The special features of the guard under consideration are these: A single disk in two parts with arms (funnels) from both sides. It is hinged by bolting at the periphery of the disk. There is a guide permitting a perfect opposition of the two parts of the disk when closed. It is adjustable to many different sizes of rope, and when placed on the line fits closely by tying on both sides. Rivets are used throughout, thus increasing the strength. The distal portion of the arms is cut longitudinally into three strips so that they may be bent to come into immediate contact with the rope when tied.

The details of construction as worked out after considerable experience are as follows: Flat sheet galvanized iron is used for all parts of the guard; 20 to 24 gauge answers best, for that weight of iron is strong enough and does not make the guard too heavy. The shield should not be less than 3 feet in diameter. The funnel tubes should be 18 inches long on each side of the shield. The central aperture can be made to fit any size of rope. One made for a 3-inch diameter rope will serve for all smaller sizes. When made or used for encircling a number of lines at the same time the shield should be 4 feet in diameter and the funnel tube enlarged and supported by five flanges and five rivets, instead of three. The guide piece, which is the one important feature of this guard, is riveted on one side only and then bent around the circumference. The rivets which fasten the funnel tubes go through the tube flanges on each side of the shield. One bolt, two washers, and five rivets are needed for each guard. When badly damaged by use or carelessness a block of wood and a hammer are all that are required to restore the guard to its former usefulness.

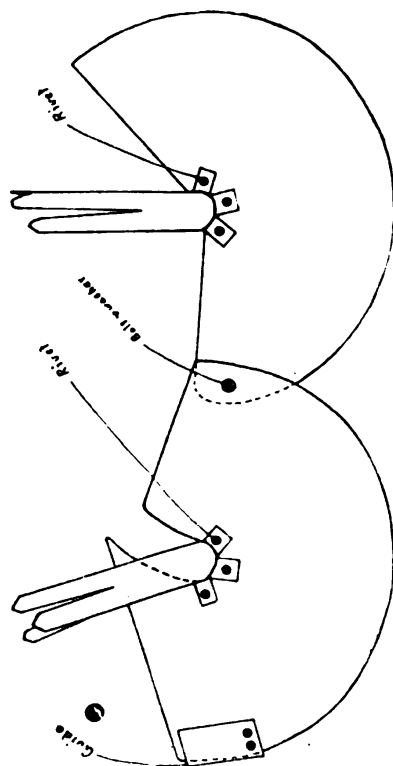
A RAT GUARD FOR SHIPS LINES



CLOSED

Diam of Disc 3'

To be made of heavy G.I. Copper rivets.
For use on lines up to diam 4"



OPEN

63p. 1st.

REPRINT FROM ORIGINAL ILLUSTRATION IN PUBLIC HEALTH REPORTS.

CLINICAL NOTES.

CASE REPORTS.

From the United States Naval Hospital, Philadelphia.¹

By Passed Assistant Surgeons G. B. CROW, L. W. JOHNSON, A. J. TOULON, and C. W. SMITH, United States Navy.

A CASE OF VERY LARGE STONE IN KIDNEY WITHOUT ACUTE SYMPTOMS.

J. B. C., Fr. 1 cl., age 23, a native of Indiana. Admitted to hospital December 11, 1911, with diagnosis of tuberculosis *pneumonica*.

Patient dated the present trouble from an attack of pneumonia in the right lung in 1910.

For the past five or six months he had had pain in the back in the lower dorsal region and along the lower margin of the thorax on the left side. Stooping or bending the back in any way increased the pain. He had lost some weight and his general appearance was that of one below normal health.

The two sides of the chest showed marked irregularity, the right being contracted and the right shoulder lower than the left. The lower end of sternum was depressed. The spine was deflected to the right in lower dorsal region. There seemed to be some kyphosis in the region of the lower two or three dorsal vertebræ, and pressure over the spine in this region and over the left erector spinæ muscle produced considerable pain. Physical examination of chest showed the signs of a greatly thickened pleura on the right side, and this was confirmed by radiograph. There was no evidence of any active process in the lung. There was some cough. After repeated examination no tubercle bacilli were found in the scanty sputum. The urine was normal. There was no fever. There had never been any pain of a colicky nature. In the presence of the marked and probably increasing deformity the pain spoken of seemed satisfactorily explained, and for a few weeks the acceptance of such explanation caused us to neglect one diagnostic aid—a radiograph of the kidney region. Near the end of January, however, blood and pus in considerable quantities appeared in the urine. Two cultures were sterile. Stained smears of the sediment did not show tubercle bacilli. Cystoscopic examination showed an apparently normal bladder and

¹ Received Mar. 18, 1912.

ureteral orifices. A radiograph of the kidney regions showed in the region of the left kidney a large irregular shadow, evidently a stone or stones, filling the pelvis and branching out in irregular fingerlike processes to the cortex. A second radiograph gave a picture exactly like the first. The right kidney was apparently normal.

On February 28 an operation was performed under chloroform anesthesia. Through an oblique lumbar incision the kidney was split from pole to pole along its convexity. Several large stones were removed, four as large as hickory nuts and one much larger. A tube was placed in the pelvis of the kidney and the wound was packed to control hemorrhage. On March 15 the patient was passing 1,500 to 1,800 c. c. of normal urine by way of the bladder and some by way of the wound, which was about large enough to admit the little finger and was closing rapidly.

The case is of interest because of the absence of acute symptoms in the presence of several enormous stones. There was never acute pain and apparently no hæmaturia until shortly before operation.

PNEUMONIA FOLLOWING AN INJURY.

A. B., age 19. Admitted January 22, 1912. Thirty-six hours before admission he fractured his right clavicle by falling from his hammock. A Sayre dressing and Velpeau bandage were applied and the X ray showed the fragments in good position. On January 24 the temperature rose to 104° ; there was bloody expectoration, with bronchial breathing and moist râles at the base of the left lung.

Until January 31 the temperature was constantly about 103° , with physical signs of lobar pneumonia involving the lower lobe of the left lung. On February 1 the temperature fell to normal and the patient appeared much better.

On February 2 the temperature suddenly rose to 104° and he was much weaker, with vomiting and suppression of urine. In spite of treatment he died at 4.15 p. m.

The autopsy showed pneumonia of the lower lobe of the left lung, tuberculosis of the middle lobe of the right lung (an old process), acute nephritis of both kidneys, dilatation of the stomach; no evidence of any injury of the lung or pleura by the broken bone.

In this case did the fracture or the restriction of motion of the chest by the dressing induce the pneumonia, or was it a coincidence? Was the nephritis caused by the pneumonia or the fracture, or was it a coincidence? The dilatation of the stomach is of particular interest in view of Fussell's recent article showing that dilatation of the stomach in pneumonia is not so rare a complication as is generally supposed.

THE EFFECT OF SALVARSAN ON THE AVERAGE NUMBER OF SICK DAYS
FROM SYPHILIS.

One of the most notable effects of the administration of salvarsan in the treatment of syphilis is the great reduction in the average number of sick days per patient.

Taking a series of 44 cases the average number of sick days per case amounted to $49\frac{3}{2}$ days, but this includes a number of cases which, owing to complications and certain intercurrent diseases such as nephritis, iritis, gonorrhea, etc., were not given salvarsan immediately upon the determination of a diagnosis of syphilis. Then, again, there were many delays in receiving reports of Wasserman reactions, and at times there were delays of several days, owing to the fact that salvarsan was not always in stock.

If we were to compute the average sick days from the date of the first injection of salvarsan, there would be a marked decrease in the average, or $29\frac{3}{2}$ days per case, as shown in the table of cases below.

All salvarsan was administered intravenously in full doses of 0.6 gram, and at no time was there a more marked reaction than a slight rise in temperature, with possibly a little nausea, which usually subsided within 24 hours. In several cases, immediately following the injection, the reaction was quite marked, the temperature reaching 103, with severe retching, vomiting, and chills. These symptoms, however, subsided in a few hours, and investigation showed that these men had partaken of food within a short time prior to the injection. Our rule in this hospital has been to give salvarsan after the patient has fasted at least 12 hours.

At the present time we do not consider that there is any contra-indication to the use of salvarsan, once a positive diagnosis of syphilis has been established. In three cases of severe syphilitic affections of the eyes remarkable results have been achieved, and in several cases where the patients were running high temperatures and suffering intense pain the temperature became normal and the pain disappeared after the administration of the first dose of salvarsan. Two doses of salvarsan were generally given, and in the more severe cases three doses.

The following is a list of the cases from which the above data were obtained:

Initials.	Ad- mitted.	Dis- charged.	Total days.	Total days from first injection.	Remarks.
	1911.	1911.			
B. M.	Sept. 12	Dec. 5	84	74	Complicated.
C. F. F.	Sept. 8	Nov. 24	77	60	
E. C. D.	Aug. 15	Nov. 27	104	63	Do.
W. R. G.	Oct. 10	Nov. 2	23	18	
G. A.	Oct. 2	Nov. 6	35	17	
A. G. Mc.	Sept. 25	Dec. 4	70	50	Do.

Initials.	Ad- mitted.	Dis- charged.	Total days.	Total days from first injection.	Remarks.
	1911.	1911.			
P. F. C.	Sept. 25	Dec. 4	70	50	Complicated.
R. J. L.	Sept. 12	Nov. 11	63	43	
C. B., jr.	Sept. 25	Nov. 9	44	40	
H. A. G.	Aug. 30	Nov. 2	63	58	Do.
	1912.				
H. D.	Oct. 20	Jan. 4	76	67	Do.
	1911.				
E. H. Y.	Oct. 5	Nov. 10	36	15	
W. H. E.	Aug. 1	Dec. 18	139	53	Do.
C. J. B.	Sept. 25	Nov. 9	44	13	
J. A. M.	Oct. 16	Nov. 27	42	31	
C. A.	Oct. 18	Dec. 13	56	47	
J. A. B.	Oct. 27	Oct. 31	4	3	Discharged from service.
G. J. H.	Oct. 28	Nov. 20	23	20	
M. A. K.	Sept. 13	Nov. 6	54	19	
A. W. G.	Sept. 21	do	46	19	
W. L. B.	Oct. 28	do	9	6	Had previous dose.
C. W.	Sept. 9	Dec. 26	108	36	Complications.
E. C.	Oct. 31	Nov. 24	24	17	
L. J. W.	Sept. 11	Nov. 10	60	3	
F. S.	Oct. 21	Dec. 11	52	34	
M. C.	Oct. 27	Nov. 24	28	17	
R. K. B.	Nov. 3	do	21	17	
J. S. W.	Sept. 26	Dec. 26	91	49	Complicated.
W. F.	Nov. 3	Nov. 24	21	16	
E. A. D.	Nov. 6	Nov. 27	21	19	
A. P.	Nov. 9	Dec. 7	28	22	
G. S.	Nov. 8	Dec. 11	33	26	
J. H.	Nov. 3	Dec. 19	46	34	
A. L. R.	Nov. 13	do	36	34	
W. M.	Oct. 2	Nov. 27	56	40	
W. J. W.	Nov. 20	Dec. 9	19	17	
H. D. W.	Oct. 5	Dec. 27	83	19	Do.
K. K.	Nov. 16	do	41	19	
C. K.	Nov. 24	do	33	19	
A. R.	Nov. 18	do	39	19	
G. W. K.	Nov. 22	Dec. 19	27	6	
W. H.	Nov. 11	Dec. 26	45	13	
J. E. S.	Nov. 9	Dec. 30	51	17	
	1912.				
L. B. L.	Nov. 29	Jan. 5	37	23	
Total			2,162	1,282	
Total cases.....					44
Total days.....					2,162
Sick days per case.....					49.4
Total cases.....					44
Total days.....					1,282
Sick days per case from first injection.....					29.1

A CASE OF EXTENSIVE ADENOCARCINOMA.

F. W. F., age 40, admitted January 18, 1912. History of stomach trouble with loss of appetite and of weight since the first part of December, 1911; since Christmas he has been constipated and has eaten very little.

On admission the abdomen was found distended there was tympany in front and dullness in the flanks; a mass could be outlined in the region of the descending colon; no results by enema or catheter; temperature and pulse normal. There was history of tumors in his family for three generations.

OPERATION BY RECTUS INCISION.—A large quantity of straw-colored fluid was evacuated and a nodular mass was found, as large as a

coconut, apparently involving the omentum; the peritoneum, liver, and intestines were studded with smaller nodules. The large mass was excised, and on section showed a yellowish-white, solid growth with large vessels supplying it; on microscopic examination it proved to be an adenocarcinoma.

Nine days later the bowels moved for the first time, and after that enemas were frequently necessary; cachexia soon became marked, and it was once necessary to tap the abdomen, about 2,000 c. c. of fluid being removed. Death by exhaustion intervened about six weeks after operation.

AUTOPSY.—All organs below the diaphragm were matted together and studded with nodules on the surface and throughout their substance, but no evidence of the growth was found above the diaphragm.

The sudden onset of the symptoms and the delay in their appearance until the growth was far advanced are of interest, though not of uncommon occurrence in such cases. The absence of involvement above the diaphragm, with such widespread involvement below it, is remarkable.

A CASE OF EXCEPTIONALLY SEVERE SYPHILITIC IRIDO-CYCLITIS.

With marked changes in the interior of the eye and total loss of light perception.

C. S. A., P. M., admitted to the hospital December 10, 1911. Characteristic symptoms of secondary syphilis of a severe type were present and the Wassermann reaction was positive. Intravenous injections of salvarsan, 0.6 gm., were administered on December 13 and January 4. Mercury was given from the time of the first admission. On February 9 all active symptoms of syphilis had disappeared.

On February 12 he complained of pain in the right eye and dimness of vision. As the iris was somewhat muddy in appearance, two drops of a 1 per cent solution of atropine were instilled in the affected eye every four hours until there was complete dilatation of the pupil. On February 15 severe pain with tremendous ciliary and conjunctival injection developed. At this time there was total loss of light perception, and examination of the interior of the eye showed optic neuritis, hemorrhage at the macula, vitreous opacities, and opacities in the posterior part of the lens. Hot boric acid compresses were applied to the eye and the pupil kept well dilated. No improvement followed, and on the 19th of February a third injection of salvarsan was given. Mercury and potassium iodid in increasing doses were exhibited.

On February 21 the ciliary and conjunctival injection was greatly reduced and there was very little pain; loss of light perception was still complete. By March 9 he had good light perception and the

lesions of the interior of the eye were gradually clearing up. While the degree to which the vision will be restored can not be determined, it seems probable that decided improvement will continue.

This case is of interest because of the extreme severity of the eye involvement coming on after a most vigorous antisyphilitic treatment and an apparent clearing up of all symptoms. It is also of interest in that the eye showed almost immediate improvement after a third injection of salvarsan. This would tend to show that grave eye involvement developing after treatment of syphilis by salvarsan is an indication for more salvarsan rather than a contraindication for its use.

AN INTERESTING CASE OF GUNSHOT WOUND.

By Passed Assistant Surgeon J. M. MINTER, United States Navy

It is through the courtesy of Dr. J. O. Thompson, superintendent of the Canton Hospital, who kindly turned the patient over to me for operation, that I am enabled to report the following case:

A soldier in the Chinese Army was shot by one of his comrades with a soft-nose bullet, which took the following course: Entered the right hip about 3 inches below the center of the iliac crest, passed downward and inward, penetrating the penis and urethra just below the peno-scrotal junction, passed through the left testicle, penetrated the left thigh posterior to the femur, and emerged at the junction of the middle and lower thirds of the thigh.

The accident happened several days before the patient applied to the hospital for treatment, and all urine was being passed through the left testicle, which was adherent to the scrotal wall. The wound in the urethra had entirely occluded the distal urethral opening.

An external urethrotomy was performed, the severed ends of the urethra approximated with sutures, and a soft rubber catheter inserted.

As the left testicle was nothing but a sloughing mass adherent to the scrotal wall, it was excised, after breaking up all adhesions, the scrotal cavity curetted, and the incision sutured, leaving a small drain in the lower angle of the wound.

The hip and thigh wounds were well irrigated and dressed antiseptically. The rubber catheter was removed on the fifth day and sounds passed.

With the exception of a slight leakage of urine for a day or so, all wounds healed rapidly, urine was being passed freely through its normal outlet, and the patient insisted on leaving the hospital 10 days after admission.

FRACTURE OF HUMERUS BY MUSCULAR ACTION.

By Assistant Surgeon R. G. DAVIS, United States Navy.

The possibility of fractures of the humerus by muscular action is noted in the textbooks, but their actual occurrences seldom come to our notice, hence I take the liberty of reporting the following case:

C. N. L., O. S., U. S. N. On March 16, 1912, while attempting to throw a small stone, the patient suddenly found his arm locked behind his head. Examination revealed a complete fracture of the humerus at the junction of the middle and lower third. The arm was dressed in a circular splint and firmly bandaged to the side over an axillary angular pad. The repair was uninterrupted and result perfect at the end of six weeks, as shown by a skiagram.

The patient was healthy and robust, with no previous history of fracture, syphilis, or tuberculosis that might predispose to bone weakness.

EDITORIAL COMMENT.

PARTICIPATION OF MEDICAL OFFICERS IN PROFESSIONAL CONFERENCES.

The importance to the Medical Corps as a whole, and to the individual medical officers concerned, of attendance upon medical meetings and conferences is generally appreciated, but the present shortage in the corps, exceptional demands of the service, and the necessity for economy in the expenditure of mileage frequently prevent the official assignment of naval delegates upon occasions when such representation would be eminently desirable.

It frequently happens, however, that there are opportunities for medical officers to come into professional contact with their confrères in civil life through attendance upon the meetings of local societies, invitations to which are, as a rule, courteously extended.

The recent meeting of the Fifteenth International Congress on Hygiene and Demography in Washington, and that of the Association of Military Surgeons in Baltimore, have served to emphasize the value of such professional gatherings. Fortunately at these conferences the Medical Corps was well represented, 12 papers being presented upon the former occasion and 7 at the latter, while many additional medical officers attended and took part in the discussions.

That medical officers of the fleet are keenly alive to the value of such interchange of views is indicated by the successful results of the conferences of medical officers held each winter in Guantanamo. The papers presented and discussed have been of a high order, and it is hoped that the Bulletin will hereafter be in a position to publish many of these for the information of the entire corps.

The Association of Military Surgeons is a society which should particularly appeal to us. It is the only association in this country through which the medical officers of the different military branches of the Government can meet and exchange ideas, and this professional contact is not limited to their fellow-countrymen, but extends to the representatives of the military and naval services of foreign lands. In order that we may take full advantage of the opportunities so presented, it is especially desirable that medical officers should not only affiliate with the association as members, but interest themselves in its welfare and earnestly participate in its various activities.

SIGHT TESTS FOR SEAMEN.

The departmental committee appointed by the Board of Trade of England, June 22, 1910, "to inquire what degree of color blindness or defective form vision in persons holding responsible positions at sea causes them to be incompetent to discharge their duties, and to advise whether any and, if so, what alterations are desirable in the board of trade sight tests at present in force for persons serving or intending to serve in the merchant service or in fishing vessels, or in the way in which these tests are applied," have completed their labors and returned their report.

The committee concludes that there is no evidence of casualties in the British merchant service having been caused by defective vision, yet they recommend a higher standard of visual tests than now in vogue. Practical experiments with actual ship's lights "show that defective form vision may render a man incapable of distinguishing the color of ship's lights, this effect being most marked at the greater distances (2,000 and 3,000 yards)." It is their opinion that long experience compensates to a considerable extent for a certain decline in physical fitness due to age, but "no person who is liable to fail to detect the presence or to confuse the colors of average ship's side lights at a distance of 1 mile is competent to discharge the duties of an officer of the watch," and that it would not be safe to depend on binoculars to compensate for defective sight.

The members recommend that both color skein and lantern tests be used, but that the deep-red skein be superseded by a dark-brown one, which is often confused with green, and that the wool test should consist in dividing the skeins into specific groups, one group for each test skein, and requiring the candidate to divide each group into two parts, those which resemble in color the test skein and those which do not; the lantern tests to be carried out when the eye is in the condition prevailing when lights are being observed at night. They further recommend "that steps be taken to impress upon the authorities of training ships, parents, and guardians sending boys to sea, and owners taking apprentices, the desirability of the eyesight of these boys undergoing an expert examination before they adopt the sea as a profession."

Another point the committee brings forward and one which is of great importance is the necessity for insuring the thorough testing, for color and form vision, of all witnesses who give evidence as to the nature or position of colored lights or signals, when judicial inquiries into the cause of shipping casualties are being held.

From the exhaustive investigation of this committee and its conclusions it would appear that the sight tests as prescribed for admission to the United States Navy should be most carefully and pains-

takingly applied, and that the standard for form vision of 20/20 in both eyes should be rigidly adhered to in the examination of those who may do duty on watch or look-out.

The recommendation that the sight of all individuals contemplating adopting the sea as a career be examined prior to their application appears to be most appropriate, but experience has shown that, as far as the Navy is concerned, civilian examiners have but the vaguest idea of what constitutes acceptable sight and no conception of the limit of safety. Ignorance of the demands made upon the visual mechanism and of the great importance of perfect sight unaided by glasses in the Navy has given rise to the most trying situations. Scores of reports and letters from reputable ophthalmologists supporting a young man's claim to fitness for appointment to the Naval Academy have been received, but owing to unfamiliarity with Navy requirements they have been of but slight value.

A country-wide campaign of instruction would be necessary to carry out this recommendation, and medical examiners and reviewing authorities should keep in mind this lack of appreciation of requirements on the part of civilian practitioners in passing upon those cases called in question.

RECENT LEGISLATION AFFECTING THE MEDICAL DEPARTMENT OF THE NAVY.

The naval appropriation bill of this year (naval act of Aug. 22, 1912) contained legislation of the greatest importance and interest to the Medical Department.

By it a Medical Reserve Corps was established, in the following words:

That a Medical Reserve Corps, to be a constituent part of the Medical Department of the Navy, is hereby established under the same provisions, in all respects (except as may be necessary to adapt the said provisions to the Navy), as those providing a Medical Reserve Corps for the Army, and as set forth in the act to increase the efficiency of the Medical Department of the United States Army, approved April twenty-third, nineteen hundred and eight.

The influence of this paragraph upon the efficiency of the Navy in time of war is far reaching and provides an ample personnel for the handling of wounded in the most humane and modern manner.

The Dental Corps, which it creates, is a part of the Medical Department, and will consist of 30 assistant dental surgeons, all being first appointed as acting assistant dental surgeons and receiving commissions (if qualified) at the end of three years' service. Members of this corps will receive the pay and emoluments of officers of corre-

sponding grade in the Medical Corps and have the same retirement privileges, but no promotion.

In addition to the 30 assistant dental surgeons, comprising the regular corps, the department is authorized to temporarily appoint, after satisfactory examination, acting assistant dental surgeons in sufficient number to properly care for the personnel of the Navy, but not to exceed the proportion of one to each thousand of the authorized enlisted strength of the Navy and Marine Corps.

The grade of chief pharmacist was established by the following paragraph:

That pharmacists shall, after six years from date of warrant, be commissioned chief pharmacists after passing satisfactorily such examination as the Secretary of the Navy may prescribe, and shall, on promotion, have the rank, pay, and allowances of chief boatswains.

The act further provides for the payments made to hospital stewards who were granted permanent appointments as of date of May 13, 1908, which have heretofore been disallowed by reason of a decision of the Assistant Comptroller of the Treasury, dated December 29, 1910.

NAVAL HOSPITAL CORPS.

Since the establishment of the Hospital Corps there has been a consistent effort to maintain high standards of admission and promotion, and as a result the personnel has been made up of unusually capable and reliable men. Their aptness for learning, their close attention to duty, and the high order of intelligence displayed in performing it, have called forth much favorable comment.

Gratifying evidence of the high type of men composing this corps has recently been furnished by two of its members, who by their individual and unaided effort successfully passed an examination for appointment to the Pay Corps of the Navy, one of them standing first among all who competed.

Such work is most commendable, and should stir the ambitions of all.

PROGRESS IN MEDICAL SCIENCES.

GENERAL MEDICINE.

Surg. A. W. DUNBAR and Passed Asst. Surg. J. L. NEILSON, United States Navy.

Way, L. F. K., Lieutenant, R. A. M. C. **Bier's hyperæmic treatment in gonorrhoeal epididymitis.** Jour., R. A. M. C., Vol. XIX. No. 1, July, 1912.

In 16 consecutive cases Way found the pain promptly relieved and practical subsidence of disability in an average of about nine days:

APPLICATION OF TREATMENT.—The treatment of the cases was as follows: On admission to hospital the patient was put to bed and given a brisk purge. The urethra was syringed out twice a day with a weak solution of potassium permanganate, after which the patient was told to pass his urine to wash out the posterior urethra. Urotropine (gr. x) was given twice a day well diluted with water; when micturition was painful, tincture of hyoscyamus was added.

The local treatment was carried out by taking a piece of ordinary rubber tubing, one-fourth inch in diameter, and applying it round the scrotum above the affected testicle and fastening it by means of a pair of Diffeubach's artery clips; when there was any difficulty in applying the tubing to a single testicle both testicles were included. There is no necessity to put lint or any other protection under the tubing. A small pillow or other support was placed under the scrotum to keep the testicles somewhat raised.

The great essential of the hyperæmic treatment is that it must not cause pain. In only one of my cases was the pain not relieved almost at once; the tubing was obviously too tight, and on slackening it a little, relief was soon obtained.

Special care must be taken that the tubing is not too tight, because in the case of the scrotum changes in the color of the skin are less obvious than elsewhere, and also there is no distal pulse to be felt, so that reliance must be mainly placed on the absence of pain.

In my cases the tubing was kept on as a rule for 12 hours per day, with an hour's interval in the middle of the day, but in some cases for an hour or two longer.

If applied in the early stages, pain and the inflammatory process is arrested and "an ultimate cure is effected very much more rapidly than by any other method of treatment," which is moreover quite clean.—(SURG. C. N. FISKE, U. S. NAVY.)

WELCH, J. EDGAR, M. D. **Normal human blood serum in obstetric practice.** The American Jour. of Obstetrics, April, 1912.

The use of diphtheria antitoxin during the past 18 years has shown that the serum of animals possesses decided therapeutic value

(591)

as well as undesirable qualities. The latter, under the terms of "anaphylaxis" and serum sickness, has recently received much attention.

Subcutaneous injections of homologous serum do not produce the objectionable conditions. The writer has had experience in 32 cases of the use of normal-blood serum in various hemorrhagic conditions of the newborn, in which, owing to the rapidity with which a fatal result ensues, a well-known easily obtainable specific is extremely desirable.

Welch states that from his experience the use of normal human-blood serum given subcutaneously is a specific in these cases. Contrary to the generally accepted opinion that the bleeding is due to an abnormal condition of the blood itself, e. g., a diminution in the number of the blood platelets, Welch believes that it is due to a disturbance in the ferment content of the endothelial cells of the blood vessels due to malnutrition, and the effect of normal human-blood serum in controlling hemorrhages appears to be through its nutritional effect on these endothelial cells.

Welch has used this serum in cases of bacteriaemia and in controlling hemorrhage during surgical operations on those deeply jaundiced, with apparently good results. While not replacing the use of the whole blood by transfusion, in certain cases the writer is of the opinion that the subcutaneous injection of the serum avoids some dangers and affords advantages, such as ability to repeat the administration indefinitely.

In infants the dose was started at 112 c. c., reduced amounts from the above to 10 c. c. being administered daily for five days.—(A. W. D.)

WOLFSOHN, J. M., M. S., M. D. **The cutaneous reaction of syphilis.** Bulletin of the Johns Hopkins Hospital, Vol. XXIII, No. 258, August, 1912.

The desirability of simple yet accurate tests for the early diagnosis of cases of infectious disease is apparent. Since its discovery by Koch, tuberculin has been used in many ways for diagnostic purposes and great strides have been made in the early diagnosis of tuberculosis by its use, but to devise these methods the causative organism had first to be isolated and cultivated. This latter requirement has been fulfilled in the case of syphilis by the growth, in pure culture, of the *Treponema pallidum* by Noguchi.

This eminent scientist found:

That in order to cultivate the pallida directly from the primary lesions in man, two all-important conditions must be fulfilled: 1. The maintenance of strict anaerobiosis; and 2, the property possessed by spirochaetes pallida of migrating in solid media in which they are multiplying. The culture media used consists of (1) ascitic fluid containing a piece of sterile placenta; and (2) ascitic fluid agar, also containing a piece of placenta.

The organisms are grown for 6 to 50 days. After sufficient growth has taken place the tissue is removed and the solid media and organisms ground in a mortar and diluted with the ascitic fluid culture. The mixture is then heated for 60 minutes at 60° C. and 1 per cent tricresol is added as an antiseptic. Noguchi has called this final, sterile emulsion "luetin," and it is this preparation which was used in the tests reported in this paper.

The author reports his experience with the use of this "luetin" in 150 cases; nonsyphilitics and cases of secondary syphilis, tertiary syphilis, parasyphilis, and latent syphilis. The method pursued was identical in all cases and followed that of Noguchi exactly. Both arms were injected intradermally over the biceps muscle, the left arm receiving 0.1 c. c. of luetin and the right an equal amount of the control emulsion (media only without pallida). To correctly perform intradermic injection, the hypodermic needle, which must be of very fine bore (e. g., the "Sub Q" syringe needle) is inserted almost parallel to the skin in an effort to reach the under surface of the derma. The bevel on the end of the needle should be turned toward the skin.

In all cases sterility of emulsion was assured, asepsis was observed, and a Wassermann reaction done on the blood serum and, in cases where it was indicated, on the cerebrospinal fluid. Observations of the site of injection were made daily thereafter, over a period of 12 to 36 days. "Very few reactions presented any difficulty in interpretation, i. e., practically all the reactions were definitely negative or positive."

The *negative reaction* in the majority of cases, appeared in 24 hours as a slight blush on the skin and a moderate induration or papule formation, seldom accompanied by tenderness or itching. Almost invariably, after 48 hours, the injected site would be free of induration and erythema, a pin-point ecchymosis or small yellowish pigmentation alone remaining.

The *positive reaction* varied greatly, but in the main the gross characteristics were induration and erythema. Four essential varieties were observed in different stages of syphilis.

(a) Papular form: Within 24 hours, at the sight of injection, an indurated papule developed 5-15 millimeters in diameter, surrounded by erythema and quite tender. The reaction increased in size until the third or fourth day when it either regressed or developed into the pustular form.

(b) Vesicular form: Sometimes this appeared as a bleb but more often as a group of small vesicles superimposed on an indurated tender base, occurring in a moderate reaction rapidly following the injection. As a rule it passed into the pustular variety.

(c) Pustular form: Either primary or secondary. If primary it occurred in association with the violent reactions seen in untreated.

latent or tertiary syphilis. If secondary it occurred late in the papular form or early in the vesicular variety.

(d) Torpid form: In many of the parasyphilitics showing vascular, luetic lesions, the reactions were quite negative for 3 to 7 and even 28 days, but after this period of quiescence the site of injection possessed a bluish-red tinge and a smaller or larger indurated papule was felt, which, without being tender, increased in size and in 2 to 3 days developed into a pustule after which regression took place. In these cases the control site showed nothing abnormal.

In the nonsyphilitic cases, suffering from a variety of diseases other than syphilis, when no history of syphilis could be obtained and where the Wassermann reaction was negative, no positive luetin or control reactions were obtained. The author had no opportunity to try the test on patients with primary syphilis.

Two cases of secondary syphilis in the maculo-papular stage were inoculated. Both cases had received 0.4 gram of salvarsan intravenously 24-48 hours before and had shown a positive Wassermann. Both luetin reactions were positive. Of 6 cases of tertiary syphilis in which only 5 gave a positive Wassermann, all gave a positive luetin reaction. The sixth had received 0.6 gram salvarsan one year before.

Of the 19 cases of parasyphilis tested, 7 were in those with central nervous system involvement and 12 of cardio-vascular disturbance. Of the former all 7 gave positive luetin tests while 6 were negative to the Wassermann reaction. Of the latter, 11 gave positive luetin reaction and 1 was negative, whereas only 7 showed a positive Wassermann. The one case giving a negative luetin test had a positive Wassermann.

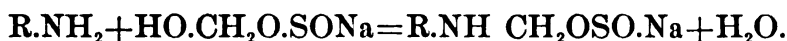
In the 23 cases of latent syphilis all gave positive luetin reactions, while the Wassermann was only positive in 10. Thus latent syphilis, so difficult to diagnose clinically and in which the Wassermann reaction is not of assistance in over 40 to 70 per cent of the cases, shows a positive luetin reaction in all the cases tried.

Constitutional symptoms appeared in only 4 cases, caused little discomfort and lasted 24-48 hours. The condition termed "Umstimmung," which Neisser and Bruck pointed out and Noguchi confirmed, appeared in this series of cases most markedly in the tertiary and latent forms. It consisted of almost as marked a reaction at the site of the control injection as at the site of the luetin injection, and "appears to be due to the susceptibility to trauma, of the skin, of syphilitics, late in the disease."—(J. L. N.)

STUEHMER, A. Clinical experience with neosalvarsan. Deutsche Medizinische Wochenschrift No. 21, 1912.

The preparation neosalvarsan, a product of the untiring researches of Ehrlich, bearing the laboratory number 914, is a true derivative

of and contains only 66 per cent of salvarsan. It is a condensation product of formaldehyde sulfoxylate of sodium ($\text{CH}_2(\text{OH})-\text{O.SO.Na}$) and salvarsan, the reaction being as follows:



The substance was introduced as a treatment for syphilis in October, 1911, after it was prepared according to Ehrlich's directions.

Stuehmer's observations are based upon 1,400 injections in some 340 patients in various stages of syphilis. Intramuscular injections were first used, later the intravenous.

The method of preparation is remarkably simple, as the dry powder is readily soluble in water and yields a perfectly neutral solution, which is used directly it is made. From 0.6 to 1.5 grams of the preparation are dissolved in 200 c. c. of fresh, distilled water, or better, 0.4 per cent sodium chloride solution. (Physiological salt solution gives rise to cloudiness and shows a heightened toxicity in animal experimentation.) This solution is used at room temperature, as subsequent warming causes injurious oxidation products to appear. The slight hypotonia is negligible.

The technique of injection is the same as with salvarsan, the use of a simple, sterilizable syringe being applicable. The preliminary and subsequent injections of a saline solution need cause no anxiety with regard to the local formation of infiltrates, as was the case when the alkaline salvarsan was employed. The new preparation lends itself well to intramuscular injection.

The contraindications to its use are confined practically to those cases in which there are grave complications, such as advanced (non-specific) nephritis, myocarditis, very advanced arteriosclerosis, and high fever. This is true only if care is exercised in regulating the dose to each case treated. Special caution is necessary in those presenting specific meningitis or other nervous affections. In recently acquired cases the most energetic treatment should be carried out, and Stuehmer used 1.5 grams at a dose, administering this quantity four times, with one day intervening between each injection, provided the patient was strong. In unretarded chancres the first injection should be 0.9 gram, after which the author advises excision of the sore; then the administration successively of 1.2, 1.35, and 1.5 grams, with one or more days elapsing between each injection. In women and delicate patients it is best to begin with smaller doses (0.6 to 0.75 gram), and then increase according to the clinical course of the disease and the condition of the patient. This method of small initial dose with gradual increase, associated with eight-day intervals between injections, is specially advised for cases of cerebrospinal syphilis and in tabes and paresis.

The results obtained were as good or better than those from salvarsan, and it is worthy of note that in all cases where gonorrhea complicated the syphilitic condition the former appeared to subside without the exhibition of any local treatment. The injections of this drug were far better borne than is the case with salvarsan, and aside from a slight diarrhea and moderate vomiting in cases treated with the largest doses no untoward symptoms were encountered.—
(J. L. N.)

SURGERY.

Surg. R. SPEAR and Surg. C. M. OMAN, United States Navy.

YOUNG, S. J. **Local anesthesia in traumatic surgery.** American Journal of Surgery, February, 1912.

There are four methods of administration, viz, local application (confined to mucous membranes), infiltration, venous, and spinal. The choice of an anesthetic depends upon the method of administration selected, as well as upon the preference of the operator.

For injuries where mucous membranes are involved, and local application is indicated, employ pure cocaine flake crystals, moistened with adrenalin chloride solution, 1 to 1,000. The adrenalin, being a vaso-constrictor, prevents excessive absorption of cocaine and restricts hemorrhage.

For injuries to fingers and toes, necessitating operation, anesthetize by infiltration. The success of this method depends upon thoroughness in technic, and by the use of novocain a quantity may safely be employed sufficient to produce an absolute degree of anesthesia. This method is also suitable for the ligation or suture of arteries and veins, tendon and muscle suture, and even amputations. In all except operations on fingers and toes the author uses with the novocain, adrenalin (or the synthetic product, suprarenin), according to Bier's formula, described below.

Venous anesthesia is useful chiefly in amputations or other extensive operations upon extremities.

Spinal anesthesia should be reserved for selected cases.

Two of these methods—infiltration and venous injection—are applicable to nearly all cases where local anesthesia is indicated or permissible.

The anesthetic consists of novocain, with or without adrenalin, dissolved in sterile salt solution. The novocain solution can be made up one-half or 1 per cent solution, to 50 c. c. of which 15 minims of adrenalin are added just before using. The toxicity of novocain is very slight. As much as 200 c. c. of a 1 per cent solution is often used in German practice. It is perfectly safe to use 100 or 150 c. c. of a

1 per cent solution, and there is no danger (so long as it is sterile) if a vein is accidentally injected.

For convenience in preparation, tablets may be obtained direct from Meister Lucius & Bruening, Hoechst a Maine, Germany. There are three tablets to be had, each with a different formula, which permits rapid preparation of any desired strength or combination. They are as follows:

Tablet A.—Novocain, G. O., 125 suprarenin. For one-half per cent solution, dissolve four tablets in 100 c. c. physiological salt solution previously sterilized.

Tablet B.—Novocain, G. O., 1 suprarenin. For 1 per cent solution, dissolve 10 tablets in 100 c. c. salt solution. This tablet has more suprarenin than tablet A. It may be used in strength of 1 or 2 per cent in vascular conditions. It restricts hemorrhage and prolongs anesthesia.

Tablet C.—G. O. 25. For 1 per cent solution, dissolve four tablets in 100 c. c. salt solution. This tablet contains no suprarenin and should always be used in operations upon the fingers or toes to avoid danger of gangrene, which might result from suprarenin.

For one-half per cent solutions always use tablet A. For 1 or 2 per cent solutions use tablet B or C. For infiltration anesthesia the following technic should be observed:

First, with a small needle inject several points around the field of operation. Use cocaine or novocain, and make the injection into the skin (not under it). At each point the skin will blanch and a wheal will be produced. This is in preparation for deep infiltration. This is carried out with a large syringe (sterilized) of 10 c. c. capacity and a long needle. Select one of the anesthetized points of the skin, plunge the needle in quickly until subcutaneous tissue is reached, then slowly advance the needle, injecting the novocain solution drop by drop as the needle is advanced to its full length, and again as it is withdrawn. In this manner inject all tissue that is within reach before needle is completely withdrawn. In the same way make infiltration, centripetally and deeply from each of the skin points previously anesthetized. Enough solution should be used to thoroughly infiltrate the field of operation, paying particular attention to the nerve supply. Now wait 15 minutes, when anesthesia will be complete, and will last from one and a half to two hours. Two things must be observed: Infiltration must be thorough, and the drug must have time to act. Do not proceed under 15 minutes. In this way few failures will result. Fingers and toes may be infiltrated in the same way, and care should be used to insert the needle deeply at right angles to the surface on each side of and close to the bone. This blocks the nerve supply effectually. Use a 1 or 2 per cent solution of novocain without suprarenin. There are no contraindications to this method, when rightly used, and if infiltration is thorough, extending beneath the periostium, amputations may be done with it painlessly.

For amputations other than fingers and toes, however, the venous method is preferred, because less failures result in the production of complete anesthesia. This method was devised by Professor Bier, of Berlin, and first reported to the German Surgical Congress in 1908.

Having sterilized the skin, the first step necessary is to empty the blood vessels. This is accomplished by the application of a sterile rubber bandage, beginning at the extremity and extending upward well above the field of operation. Starting at the proximal terminus of this bandage a second one is applied just above it and overlapping it slightly. This simply encircles the limb tightly enough to control arterial circulation. The first bandage is now removed, from above downward, after which another constriction bandage is applied about 3 inches below the remaining one. In this field, between the two circular bandages, a small incision is made, a superficial vein is dissected free and opened with a snip of the scissors, and a canula is inserted and tied in place with a ligature of catgut or silk.

One is now ready for the injection of novocain solution, one-half per cent, which should be directed downward against the valves. Considerable force will be required, and from 100 to 150 c. c. will be necessary for thorough infiltration.

The canula is now removed, the vein ligated above and below, the skin sutured and dressed. A rubber bandage may now be applied over the wound and the two other bandages removed. In this way the constriction bandage occupies an area which is anæsthetized, and the patient will not complain of its pressure. After 15 minutes the operation may be done at leisure.

To avoid any possibility of danger from the absorption of so large a quantity of the anæsthetic, before final suture the bandage may be loosened enough to allow arterial bleeding, but still obstructing the veins. In this way the excess of novocain is washed out, after which the bandage may be tightened and the wound carefully sutured.

Vein anæsthesia permits a variety of operations, such as amputation, resection, bone suture, tendon suture, extraction of foreign bodies, suture of blood vessels or nerves; in fact, any operation that may be necessary. The only contraindications are in senile and diabetic gangrene. It is a distinct advance over other forms of local anæsthesia where major operations are contemplated.—(C. M. O.)

DEAVER, J. B., M. D., LL. D. *Surgery of the bile ducts.* American Journal of Medical Sciences. June, 1912.

Attention is called to the fact that, with the exception of malignant disease, all the conditions which call for surgical interference upon any part of the biliary tract have their origin in infection.

Even malignant disease, though probably not in itself of infectious origin, seems to bear some relation to antecedent processes of infection, since it is found most often in organs which bear traces of previous inflammation.

The infecting agent usually reaches the biliary tract by way of the portal circulation, although it may reach it in a number of other ways. As a general rule, it may be accepted as proved that low-grade infections by microorganisms greatly attenuated give rise to gallstone disease, or cholecystic inflammation with the formation of stones, while acute invasions of the biliary tract by organisms of high virulence give rise to acute forms of cholecystitis and cholangitis and their accompaniments too rapidly to permit of the formation of stones. However, such acute invasion may partially subside and be converted into sluggish stone-forming catarrh.

The colon bacillus is the most common form of infection. In 142 operations on the biliary tract for various lesions 50 showed no growth. Mention is made of the bacillus typhosus, which is also a common factor in the production of stones in the gall bladder. This latter microorganism has been found in the gall bladder in cases where the most careful inquiry failed to elicit anything like a previous attack of typhoid fever. In fact, typhoid fever has been known to immediately follow operation for the removal of stones from the gall bladder where cultures from both the gall bladder and the interior of the stone removed showed typhoid bacilli.

In contradistinction to the old view that most cases of gallstones are without symptoms, the author claims that all of them have symptoms, and most of them very evident ones, which need only correct interpretation to make diagnosis certain.

As infection is the underlying cause of biliary disease, we must rely, as in other cases of infective disorders, upon that great surgical principle of the treatment of infection, namely, drainage. In fact, if we could get our patients in the early stages of the disease there would be nothing to meet but infection; in other words, cholecystostomy would suffice. Unfortunately, it is just at this stage that the disease is most difficult of diagnosis, and the physician most reluctant to advise and the patient to accept operation.

Slight epigastric distress; occasional tenderness in the right hypochondrium, sometimes accompanied by slight rigor; a "catch" in this region during inspiration; excessive flatulence and belching; bilious attacks, and at intervals perhaps a faint icteroid tinge in the skin without definite jaundice; a perceptible increase in the tension of the upper right rectus muscle as compared with its fellow; indigestion, so called, not definitely associated with taking of food—all these are truly significant of beginning disease of the bile passages. Of course

all such symptoms do not at once call for operation, but they call for careful attention and supervision.

The time of election for operation is when medical treatment fails to control interval symptoms previously mentioned or when they recur after supposed cure. The most common result of infection is gallstones. The mild cases of infection are more dangerous in this respect than are acute infections, for it is the low-grade catarrhal inflammation which causes desquamation of the lining epithelium and the production and deposit of cholesterin and biliary salts which result in stone formation. So long as calculi remain in the gall bladder the conditions are still practically ideal for operation. It is their further wanderings into the cystic, common, or hepatic ducts that give trouble.

Adhesions are a very common complicating factor. They are conservative as far as life is concerned, but they are often destructive of function. Quite frequently they produce symptoms quite similar to gallstones. It is very important to either eliminate this condition or minimize it by early operation.

Ulceration, infiltration, perforation, gangrene, cicatricial contraction, and stenosis are all very common clinical results of gall-bladder infection, and affect in various degrees different portions of the biliary tract.

One of the most important results of gall-bladder infection, or as a result of the same infection attacking the pancreatic tract, is pancreatitis, acute or chronic. Chronic pancreatitis is so often found coexistent with biliary infection that it may truly be considered as part of the clinical picture of biliary infection.

The hardening of the head of the pancreas was often noted during operations on the biliary tract as due, in its early stages at least, to lymphatic infection and congestion, and as possible of relief by drainage. It is, therefore, very important to relieve this condition at once. To restore the chronically diseased pancreas to normal, if there is a deposit of dense fibrous tissue, is impossible by any means now at our command. Most, if not all, of these instances of pancreatic change which have been so wonderfully benefited by operative procedure must have belonged properly in the category of pancreatic lymphangitis, and were not, properly speaking, cases of chronic pancreatitis.

The writer states that in this case he believes that diabetes is at times a surgical condition. While pancreatitis induced by infection of the type under discussion does not often destroy a sufficient amount of the tissue comprising the islands of Langerhan to cause diabetes, there is sufficient clinical and pathological evidence that it may do so, and thus the timely operation may prevent this dangerous condition.

Aside from the traumatic and neoplastic affections of the biliary tract, the conditions calling for surgical interference may be grouped as follows:

- (1) Noncalculous cholecystitis.
- (2) Calculous cholecystitis and its complications.
- (3) Pancreatic disease.

In groups 1 and 2, relieve the results of inflammation and insure proper drainage for a proper length of time. Pancreatic disease furnishes strong indication for temporary or permanent drainage; temporary by direct tube drainage or permanently by some form of anastomosis, commonly the cholecystoduodenostomy.

The indications for operation in diseases of the biliary ducts, tracts, and gall bladder are:

- (1) More than one attack during biliary colic.
- (2) Symptoms suggestive of upper abdominal adhesions and chronic biliary insufficiency.
- (3) Hydrops of the gall bladder.
- (4) Obstruction of the common duct.
- (5) The occurrence of acute infections, complicating previously existing biliary disease.
- (6) The evidence of pancreatic disease, acute, subacute, or chronic.

Infection of the gall bladder is most common in early adult life and not in the declining years, as ordinarily believed. In common duct obstruction the author prefers to operate in the interval between attacks of complete occlusion, but of course it is not always possible to wait this long. It may be necessary in many cases to operate during acute obstruction, in order to rescue the liver and inflamed bile passages. After a few days there is no more danger of infection of the peritoneum.

Hemorrhage, one of the greatest dangers, does not occur in the early stages, but only in the cases where a chronic cholemic state has existed for a long time. Fortifying the patient with injections of blood serum, preferably obtained from a healthy member of the family, is advisable. Large doses should be used—50 to 200 c.c.—subcutaneously. Human serum is preferable to that of horses or other animals. Gelatin and calcium salts are not of much value.

The Cammidge test has not proved of much diagnostic value in determining the presence of pancreatic disease.

The writer believes that in every operation upon the gall bladder it should be drained, granting that the viscus is not diseased to the extent of being rendered functionless. Drainage of the common duct is imperative when we have opened it for stone in all grades of cholangitis, and particularly in cholecystectomy, in the presence of liver infection and pancreatic involvement, even when there are no stones in the duct.

Excision of the gall bladder is practiced in malignancy, hydrops of the gall bladder, chronic empyema of the gall bladder, gangrene, when the cystic duct is not patulous, and when many small calculi are imbedded in the gall-bladder mucosa.

The author enlarges upon the dangers of procrastination and too much deliberation. He does not favor dawdling with duodenal buckets, fallacious laboratory methods, etc.—(C. M. O.)

SHERMAN, WILLIAM O'NEILL, M. D. **Vanadium steel bone plates and screws.**
Surgery, gynecology, and obstetrics. June, 1912.

The writer gives the results of various experiments carried on during the past year with the different kinds of steels used in the manufacture of surgical instruments, particularly the Lane bone plates, the object being to secure a grade of steel that would withstand the strain without fracturing.

In a series of 55 cases in which the Lane plate was used the writer was unfortunate enough to have three of them break. They were all in fractures of the femur (middle third). The breaking point of the plate was similar in all three cases, namely, the junction of the cross bar and first screw hole. Reports to the writer give a total of 18 cases in which the vanadium steel plate has broken.

Crucible steel and tool steel is the kind of steel usually employed in the manufacture of bone plates, an average analysis of which would be:

1 per cent carbon.
0.30 to 0.50 per cent manganese.
0.03 per cent phosphorus sulphur.
0.15 per cent or under of silicon.
Balance, iron.

Vanadium spring steel:

0.45 to 0.50 per cent carbon.
0.70 to 0.90 per cent manganese.
0.09 to 1.10 per cent chrome.
0.03 per cent or under, silicon.
0.18 per cent vanadium.
Balance, iron.

The lower carbon steels are preferable to the high carbon steels on account of their greater ductility. The addition of vanadium intensifies the hardening elements, making the steel more dense and tough, thereby increasing the elastic ratio, i. e., ratio between elastic limit and the elongation.

Vanadium chrome steel is two and one-half to three times tougher than the high-carbon steels when properly treated. The ideal steel for use in a bone plate is one that has a sufficient elastic limit with the greatest ductility, so that in case a strain should be exerted we would have a bending of the plate instead of a break. It would take 500 pounds or over to break a piece of steel the size usually employed in a bone plate (femur size).

Vanadium is found in Spain, Sweden, United States, and various other countries in small deposits. It is found in commercial quantities in the Andes Mountains, Peru. It acts as an intensifier of the other elements, and also acts as a scavenger in removing the final traces of oxides and nitrites in the steel.

The vanadium steel plates are patterned after the standard eye bars used in bridge construction. By utilizing this idea and lessening the number of eyes in the plates one is procured that is very strong and not too heavy.

The screws are also especially constructed so that the thread is drawn up to the head. The slit in the screw should be broad, and the heads of the screws should be slightly rounded. The point or entering end is provided with three flutes, which not only make cutting edges, but tend to prevent undue tearing of the periosteum and also splitting of the bone.

It is advisable to have the plates and screws well "blued" to prevent oxidation before being used.

A screw driver of special construction may be had. It is made to fit tap screws. The center point fixes the screw and insures vertical and direct driving.

It has been proven that aluminum, silver, and steel are nonirritant when placed in the tissue. However, the author claims that silver is too readily bent and is of too low an elastic limit to be of much practical value, and aluminum is just the opposite, in that it possesses a very high elastic limit, but lacks bending properties.

The writer states that during the past two years they have removed 17 plates in a series of 55 cases. In several cases the plates were completely enveloped by hard cancellated bone, the removal being most difficult. If the plates are removed in from six weeks to eight months, or later, the tissues immediately surrounding the plates will usually be found stained with iron. This, however, is not objectionable. The screws were all found in position, as at the time of operation it being necessary to thoroughly unscrew before they could be removed. In some cases the bone around the thread had softened sufficiently to cause the screw to become loose. However, there was no evidence of necrosis as a result of the use of the plates and screws.

While extremists have advocated the use of plates for fractures of all long bones, the consensus of opinion of surgeons to-day is that the open method in selected cases is the operation of choice.—(C. M. O.)

PILCHER, P. M., M. D. **Observations on the diagnosis of renal tuberculosis, the indications for nephrectomy in its treatment, and the technic of the operation.** *Annals of Surgery*, August, 1912.

The author opens his remarks by the broad statement that when the kidney is once infected by tuberculosis it is doomed to destruction. Despite clinical evidence, there is no record of a case of cured tuberculosis of the kidney having been demonstrated at autopsy. The disease is frequently present for a long time before it gives rise to distressing symptoms—two, three, four, or five years—and then attention may be called to it on account of bladder involvement.

Clinically, we sometimes observe that during the period of active invasion, when the kidney is throwing off loads of pus and tubercle bacilli and is secreting much more urine than its fellow, we frequently find evidences of active tuberculosis in other parts of the body—the lungs, uterine adnexa, epididymis, prostate, etc. As the active process of the kidney becomes controlled, the general health of the patient improves, and the secondary or associated tubercular lesions show less and less activity, and often entirely disappear, despite the fact that the lesion in the kidney still exists.

Tuberculosis of the kidney is usually characterized by fewer symptoms referable to the kidney than any other inflammatory lesion of that organ, but at the same time it may present all the classical symptoms.

Clinical manifestations.—(1) The symptoms referable to the kidney itself. Palpation usually gives some tenderness and enlargement. Frequently, however, the companion kidney is more greatly enlarged and more tender. Pain is not a prominent symptom until late in the disease and may be on the sound side. Severe colic may be caused by plugging of the ureter.

(2) The bladder symptoms. They are the most prominent. Painful and frequent urination, both day and night, and a marked polyuria and pyuria. Probably 95 per cent of the tuberculosis of the bladder is secondary to that of the kidney.

(3) The physical examination. Very little can be learned from this ordinarily.

(4) Chemical examination of the secretions. Often this gives us our first clue. A marked polyuria is a common symptom. The urine is pale, acid, low specific gravity, and contains albumin according to the degree of involvement. Pus is always present and is markedly increased when the bladder is involved. If in the same

case urine is obtained directly from the diseased kidney it will be found to be like clear water, of low specific gravity, and showing very little microscopic pus. Hematuria occurs in about 25 per cent of the cases. It is apt to be small in amount, but continuous. Many tubercle bacilli and a small amount of pus may signify a suitable case for tuberculin injections.

(5) Instrumental examination. Indicated in practically every case. The presence of miliary tubercles, tubercular nodules, tubercular ulcers, and marked deformity of the ureter opening are strong confirmatory evidences. A diagnosis can almost always be made by cystoscopic and ureteral examination. It is often impossible to succeed in catheterization of the ureter on the affected side.

(6) Rectal and vaginal examination. Often of great importance. Quite frequently we find a sensitive and thickened lower segment of the ureter.

(7) The X ray. Shadows of varying densities may be shown.

(8) Surgical operation. Sometimes an exploratory operation is advisable. The writer is not in favor of exposure and catheterization of the pelvis of the kidney directly.

Indications for treatment.—Judge each individual case. In general advise a nephrectomy in every case of unilateral tuberculosis providing the companion kidney shows a normal or practically a normal secretion. If there is an extensive involvement of the lungs do not operate. In cases of bilateral involvement operate only as a last resort, and then, of course, remove the kidney most extensively involved.

Technique of nephrectomy.—Lumbar incision, starting parallel with the outer border of the erector spinal muscle at the lower border of the eleventh rib. Carry the incision downward and slightly forward to a point an inch above the crest of the ilium and then forward to the crest.

Cut posterior layer of lumbodorsal fascia, together with some fibers of the latissimus. Now, insert finger in the triangle below the twelfth rib, and by blunt dissection reach the remaining layer of the lumbar fascia; cutting this, the fatty bed comes into view. Retract the ilio-inguinal and ilio-hypogastric nerve. Continue incision forward by cutting internal oblique and complete incision upward by exposing eleventh and twelfth ribs.

If there is not enough room, dislocate the twelfth rib upward after cutting its muscular and fibrous attachments. The Mayos say there is no danger of injuring the pleura.

Use your fingers now to separate the perirenal attachments and secure the upper and lower meshes of venules by catgut ligatures. Bring the kidney into the wound, clear the pelvis and pedicle of all

fatty tissue, tie the vessels entering the kidney by heavy chromic gut and ligate.

After ligating the vessels clear the ureter for a distance of about 5 inches, and the kidney, still attached to the ureter, is carried down to the lowest angle of the wound. Now, before dividing the ureter and exposing the wound to infection, the upper portion of wound is closed, the deeper layers by catgut, the fascia accurately sutured, and the muscle masses brought into apposition, obliterating all dead spaces.

Now, in the ordinary case, the lumen of the ureter is injected with about 40 minims of pure carbolic acid at a point as far down the ureter as practicable. Withdraw needle and ligate above and below the point of entrance. Cut ureter and cauterize stump and allow it to drop back. Close wound with a cigarette drain. There is never any trouble from the carbolic acid.

As a rule, practically no attention need be paid to the bladder after the source of infection has been removed.—(C. M. O.)

TURNER, G. G., F. R. C. S. **Pyloroplasty.** Surgery, gynecology, and obstetrics. June, 1912.

The writer claims that the operation of pyloroplasty has been rather overshadowed in late years by the operation of gastroenterostomy, and he is desirous of bringing it back into its own field of usefulness. He cites 43 cases of pyloroplasty in which the original lesion was known, and he arrives at the conclusion that pyloroplasty, like gastroenterostomy, has a definite field of usefulness, and that when properly indicated its performance is attended by very good results. The cases referred to include: (a) Pyloric stenosis without ulceration. (b) Pyloric stenosis with ulceration. (c) Ulcers not within pyloric zone. (d) Duodenal ulcers. (e) Hourglass stomach. (f) Pylorospasm. (g) Cases in which no lesion could be demonstrated.

The Heineke-Mikulicz operation is preferred and seems to fulfill all the indications and without fear of recurrence of the stenosis, but it may be that the new method of Finney will greatly increase the scope of direct operations on the pylorus.

The following are some of the indications for pyloroplasty:

(1) Simple uncomplicated pyloric stenosis. This, however, is a rare disease, and although in the early days of development of gastric surgery the cases that were submitted to operation were nearly all dilated stomachs due to pyloric stenosis, in which the ulceration that had produced it was long since dead, nowadays the surgeon is brought face to face with the active ulceration which precedes it.

(2) It may be a means of dealing with a ruptured pyloric or duodenal ulcer. The writer makes it a rule to not only close the ulcer in these cases, but, if the condition of the patient permits it, and if there is a history of chronic stomach trouble preceding the accident of perforation, to do a pyloroplasty or a gastroenterostomy, depending on existing conditions. Suitable cases are those with small ulcers at the pylorus or within an inch on either side and situated in the middle line and without evidence of any more chronic ulcers on the opposite wall. If the pylorus will not easily lift up into the incision such an ulcer probably exists, and the case is more suitable for gastroenterostomy than pyloroplasty.

(3) Pyloroplasty is the operation of choice in pylorospasm. In this condition the pylorus usually looks contracted from the outside, may be felt firmly contracted, and usually entirely fails to relax on handling. From the interior of the stomach such a pylorus appears as a firm ring which will only admit the tip of the forefinger as the result of considerable pressure and which contracts down onto the finger as the latter is withdrawn into the stomach, in contradistinction to the normal pylorus, which easily gives way before the examining finger.

(4) An exceedingly useful way of dealing with the contracted pylorus that is so often met with in cases of hourglass stomach, the main lesion having been overcome by gastroenterostomy.

(5) It is as likely, as time may show, to be curative in cases of ulcer of the body of the stomach as gastroenterostomy or excision.

No ill effects can be attributed to the operation, and no case has been made worse by its performance. The cutting of the pyloric sphincter does not destroy the digestive mechanism controlling the exit of food. Researches have shown that though the escape from the stomach begins earlier and continues in greater abundance than under normal conditions, the discharge into the intestines was not entirely uncontrolled, for the operation does not interfere with the process of rhythmic segmentation in the duodenum, and the contraction of the circular fibers (Ochsner's muscle) of the duodenum just beyond the stomach has been again and again observed. After pyloroplasty no regurgitation into the stomach occurs, or at least none that produces trouble.

Regarding technique, the author states that the visceral incision should never be less than 3 inches with the center at the pylorus, and that the extremities should be sutured first, thus avoiding the inversion of too great an amount of stomach or duodenal wall.

Any difficulty which the operation presents may be greatly lessened by mobilization of the duodenum. The thinness of the duodenal wall may be a revelation to those who are not accustomed to operate on it.—(C. M. O.)

HYGIENE AND SANITATION.

Medical Director H. G. BEYER and Surg. C. N. FISKE, United States Navy.

WANHILL, C. F., major, R. A. M. C. **Notes on the ventilation of troopships in the Tropics.** Jour., R. A. M. C., Vol. XIX, No. 1, July, 1912.

Renewal of air within the troop decks of the *Rewa* is afforded by wind scoops, wind sails, and by electric-fan blowers evidently run to exhaust:

This system works well in as far as the actual ventilation of the decks is concerned, if ventilation in the Tropics is considered to consist in the removal of the products of respiration and of evaporation from the skin only, but in my opinion this is not all that is required in the Tropics. To ensure comfort it is also necessary to have currents of air, which, impinging on the body, maintain it at a comfortable temperature. In the vast spaces of the troop decks this is almost impossible, as the force of the wind is lost or is not apparent at a short distance from the source. It is also not necessary, since most of the troops prefer to sleep on deck.

When the ports are closed the need for fans and supply blowers at once becomes manifest. "The fact that fans have to be installed in each cabin is a confession of the failure of the ventilation." It is shown that not only should the plenum system be operated with vacuum, but that a perceptible movement of the air about the occupants is necessary for comfort.—(C. N. F.)

TUBBY, A. H., major, R. A. M. C. (T. F.) **The structure and functions of the foot.** Jour., R. A. M. C., Vol. XIX, No. 1, July, 1912.

We should conceive of each foot as forming its half of a dome, although the term "arch," consecrated by long usage, may be retained for convenience; the astragalus is neither structurally nor functionally a keystone, but with its ligaments and underlying muscles is a reenforced girder bridging two oblique piers. The external longitudinal arch is smaller, less elastic, and shorter than the internal and its span is much nearer the ground. The anterior transverse arch is formed by the heads of the metatarsals when the foot is off the ground. In flat foot the posterior arch yields first and the subsequent sinking of the anterior arch may be one of the causes of metatarsalgia, although in standing this arch is normally obliterated; the shock of striking these metatarsals in walking is absorbed by the buffers comprised in the bones of the internal longitudinal arch, although there is no definite relaxation of the latter's muscles and ligaments; there is merely rotation downward and outward of the astragalus on the os calcis, which is also the attitude of rest, and in an exaggerated degree constitutes weak foot or flat foot in abnormal abduction or eversion. As the foot is advanced with each step, normal adduction (pointing nearly to the front) should restore the arches. The feet should not be turned out in walking or marching.

"If the feet are turned out in walking, as is often seen in a town-bred or weakly man, the feet are maintained in the attitude of rest, and this becomes stereotyped until flat foot supervenes" [particularly as the individual develops weight]. The position directed forward "gives the maximum of strength, agility, and poise with the minimum of fatigue, because the major portion of the body weight falls on the outer comparatively nonelastic arch. How many men are invalided from armies because of flat feet, and is it not correct that the men are taught to stand with their feet turned out, sometimes at an angle greater than 45° ? Standing with the feet turned out is more provocative of flat feet than walking, because in the former position the feet are not alternately rested as in walking."

One predisposing cause of flat foot is a shoe so narrow across the toes that the great toe is permanently everted or prevented from adduction "so essential to the maintenance of the internal longitudinal arch"; another cause is a high-heeled shoe which drives forward and so cramps the toes that they can not relieve the heads of the metatarsals of their share of the body weight. The waist of the shoe should be of sufficient firmness and strength to obviate sinking of the foot and consequent cramping, which likewise limits the freedom of its physiological movements. The soles should not be too thin so that a "rocker" action results. The upper should furnish proper depth, particularly for the plantar flexion of the great toe; permanent dorsi-flexion and abduction results in bunion. Shoes should not be too short and the inner border of their soles should be straight or slightly concave. "The width of the sole should be a little more than the foot when the whole weight of the body is thrown on it." Frequently a valgus wedge of one-eighth inch additional thickness to inner border of sole and heel will properly distribute the weight and tend to the prevention or limitation of weak or flat foot. Nails are favored because they assist in preventing concussion of the feet.—(C. N. F.)

TROPICAL MEDICINE.

Medical Inspector E. R. STITT, United States Navy.

EDIE, E. S., EVANS, W. H., MOORE, B., SIMPSON, G. C., and WEBSTER, A. The antineuritic bases of vegetable origin in relation to beriberi, with a method of isolation of torulin, the antineuritic base of yeast. *Annals of Tropical Medicine and Parasitology*, Vol. VI, No. 2, July 31, 1912.

The first part of this paper is taken up with a review of the important work done on the etiology of beriberi by various investigators since 1909.¹

¹ Although most of the results of these investigations are known to the readers of the *Bulletin*, the reviewer believes that a concise statement of them, grouped compactly, will not be amiss, as they were published in a variety of journals issued in different parts of the world. J. L. N.

Fraser and Stanton (Studies from the Institute for Medical Research, Malay States, No. 12) demonstrated that the active antineuritic substance of rice meal is soluble in water and alcohol; stable in acid, but unstable in alkaline solution; its thermolability varies with varying physical factors; it is not a phytin body or a fat; it is probably not a protein; it does not contain phosphorus. They confirmed the fact that the phosphorous content of rice is an indicator of its safety as an article of diet, and with a view to the prevention of beriberi recommended administrative measures to prevent the sale, in the Malay States, of rice with less than 0.4 per cent phosphorus pentoxide.

Eijkman (Archiv. f. Schiffs und Tropen Hygiene, Bd. XV, p. 698, 1911) reviews the work of his colleagues and himself, performed in Batavia and Java, where in the *years 1889 to 1897* they had demonstrated that beriberi could be cured and its occurrence prevented by the use of hand-milled rice. His recent work is upon the cure of polyneuritis in fowls by extracts of rice meal, 5 grams of which contained only 0.085 per cent of P_2O_5 and 0.012 per cent of N.

Shiga and Kusama (Archiv. f. Schiffs und Tropen Hygiene, Bd. XV, 1911) report extensive investigations disproving the bacterial and toxic theories of beriberi, and confirm the work of Eijkman, Fraser, and Stanton.

Kilbourne (Philippine Journal of Science, Vol. V, p. 127, 1910) shows that the potassium content of rice meal is of almost equal value to the phosphorous content as an indicator of its safety as a food.

Hight in Siam (Philippine Journal of Science, Vol. V, p. 73, 1910) and Aron and Heiser in the Philippines (Philippine Journal of Science, Vol. V, pp. 81 and 98, 1910, and Vol. VI, p. 229, 1911, respectively) have shown that beriberi followed the introduction into those countries of steam-milled rice, and that in institutions the disease disappeared on the reintroduction of hand-milled rice. They further demonstrated that rice can be machine milled without impairment of keeping powers and palatability, yet retaining the valuable outer layers.

Chamberlain and Vedder (Philippine Journal of Science, Vol. VI, pp. 251 and 395, 1911) showed that an alcoholic extract of rice meal, concentrated till free of alcohol, retains its activity to cure polyneuritis. Also that the active substance is able to dialyse through parchment and that it is absorbed by bone black.

Funk (Lancet, No. 4601, 1911) isolated from rice meal a crystalline nitrate of an organic base which is extremely active in reviving pigeons with polyneuritis from feeding on polished rice.

The latter part of the article is an account of the researches of the authors, largely during 1910 and 1911.

They have continued their attempts to prevent or delay the onset of, or to cure polyneuritis in animals, by various additions to a rice diet, but in all their experiments casein and phytin were the only substances that produced a favorable result, and these apparently only delayed the onset.

The one exception to this universal failure was natural yeast, which was found to possess marked preventive and curative properties, and this was also true of the base, torulin, which they obtained from the yeast and which is apparently the active antineuritic element in natural yeast. The authors give the method they used in obtaining this base and state that a dose of 0.006 gram, administered to birds with severe convulsions and lameness, improved the convulsions in 4 hours, enabled them to fly strongly in 20 hours, and caused the lameness to disappear in 48 hours.

Attempts are being made to isolate larger amounts of the active principle and to work out more completely its constitution and its influence on metabolism.—(PASSED ASST. SURG. J. L. NEILSON, U. S. NAVY.)

PATHOLOGY AND BACTERIOLOGY.

By Passed Asst. Surg. M. E. HIGGINS, United States Navy.

RASKIN, DR. MARIE. Double-stain method for the polar bodies of diphtheria bacilli. Apoth. Ztg. XXVII, p. 10.

The author recommends a method devised by her in which but two operations are necessary, i. e., the application of a stain in which both colors are present and then washing with water, thus simplifying the usual staining methods of four steps. The staining fluid is made as follows:

	c. c.
Glacial acetic acid.....	5
Distilled water.....	95
Alcohol (95 per cent).....	100
Old sat. sol. methylene blue.....	4
Ziehl's phenol-fuchsine solution.....	4

The mixture is dropped in a thin layer over the specimen on the cover glass and the latter passed through a flame. The alcohol ignites and is permitted to burn off, after which the specimen is washed in water and dried. The entire process takes 20 to 25 seconds and the stain remains servicable for any length of time.

The polar bodies appear deep blue and the bacilli bright red. Even in specimens containing a preponderance of other bacteria, individual diphtheria bacilli may be readily and unmistakably identified.—(PHARMACIST O. G. RUGE, U. S. NAVY.)

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PONDER, CONSTANT, M. D. **The examination of diphtheria specimens: A new technique in staining with toluidin blue.** *The Lancet*, July 6, 1912.

The author gives a new method for staining diphtheria bacilli. The stain is made as follows: Toluidin blue (Grubler) 0.02 gram; glacial acetic acid, 1 c. c.; absolute alcohol, 2 c. c.; distilled water to 100 c. c. The film is made on a cover glass and fixed in the usual way. A small quantity of the stain is spread on the film, and the cover glass is turned over and mounted as a hanging drop preparation. Typical diphtheria bacilli are said to stain blue with red granules. The author prefers this method to either methylene blue or Neisser's stain.—(M. E. H.)

DUVAL, CHARLES W., and WELLMAN, CREIGHTON. **A critical study of the organisms cultivated from the lesions of human leprosy with a consideration of their etiological significance.** *Journal of Infectious Diseases*, July, 1912.

The writers state that two varieties of acid-fast organisms may be cultivated from leprosy lesions; one, a chromogenic organism which grows well on ordinary laboratory media after it has become accustomed to a saprophytic existence; the other, a nonchromogenic acid-fast organism resembling the tubercle bacillus and multiplying only on special media.

In their conclusions they state that the rôle played by the chromogenic bacillus of Clegg in the production of leprosy is as yet an unsettled question although they are inclined to ascribe to it a minor if not a negligible part.

The nonchromogenic strain while conforming to most of the current conceptions of a pathogenic organism has not been conclusively proved to be the cause of leprosy, although in the opinion of these investigators it deserves more serious consideration than any organism yet cultivated from the human leprosy lesion.—(M. E. H.)

MEDICAL ZOOLOGY.

Passed Asst. Surg. P. E. GARRISON, United States Navy.

STEPHENS, Dr. J. W. W., and FANTHAM, Dr. H. B. **Trypanosoma rhodesiense, a second species of trypanosome producing sleeping sickness in man.** Paper read before the British Medical Association, July 24, 1912.

Until recently it has been assumed that sleeping sickness was caused by only one species of trypanosome (*T. gambiense*) conveyed solely by a single species of tsetse fly (*Glossina palpalis*). In 1910 Dr. Stephens, in studying the blood of a rat inoculated with sleeping sickness from a patient under treatment at Liverpool, noticed that the trypanosome showed peculiarities of structure not before seen in

T. gambiense. The most evident morphological difference was the frequent occurrence of the trophonucleus (in the short or stumpy forms) close to or even posterior¹ to the blepharoplast, which arrangement the authors failed to find in animals infected with *T. gambiense*. Further, careful measurements of 1,000 specimens arranged in a curve showed a material difference from the curve constructed by Bruce for *T. gambiense*. From these observations the authors concluded that we now have to deal with a new species of trypanosome in man also causing sleeping sickness.

Subsidiary evidence is also forthcoming to support this belief. A case of sleeping sickness was met with which came from a region in northeastern Rhodesia, where no *G. palpalis* is known and *G. morsitans* abounds, this difference in carrier indicating that the trypanosome found was a new species. The pathogenicity of the new species (*T. rhodesiense*) is distinctly more virulent than any strain of *T. gambiense* yet described. *T. rhodesiense* produces well-marked edema in the face of sheep, a condition so far not recorded in the case of *T. gambiense*. It also causes keratitis in dogs, while *T. gambiense* does not. If human serum is mixed with a dose of *T. rhodesiense* infection of mice is prevented, no such effect being produced on *T. gambiense*. Kinghorn and York have succeeded in transmitting *T. rhodesiense* by *Glossina morsitans*, and it is of interest to note that they have shown that about 16 per cent of the wild game examined in northern Rhodesia are naturally infected with *T. rhodesiense*.

From this strongly confirmatory evidence the authors contend that the view expressed by them in their original paper (Proceedings of the Royal Society, 1910, B. Vol. LXXXIII) is well supported and that there are two trypanosomes producing sleeping sickness in man, *T. gambiense* and *T. rhodesiense*, and that the transmitting agent of the latter species is *Glossina morsitans*.—(PASSED ASST. SURG. J. L. NEILSON, U. S. NAVY.)

CHEMISTRY AND PHARMACY.

Asst. Surg. E. W. BROWN and Pharmacist O. G. RUGE, United States Navy.

KENDALL, A. I., FARMER, C. J., BAGG, E. P., Jr., and DAY, A. A. Studies in bacterial metabolism, I, II, III, and IV. Jour. Biolog. Chem., Vol. XII, Nos. 1 and 2, July and August, 1912.

It having already been comprehensively shown by Kendall (Jour. Med. Research XXV, p. 117, 1911) that "fermentation takes precedence over putrefaction" inasmuch as organisms which may attack either carbohydrates or protein will, so long as the former is

¹ It is to be noted that the authors refer to the nonflagellate end as the posterior end, while in Castellani and Chalmers the nonflagellate end is referred to as the anterior end.

available in the culture medium, attend largely to its fermentation and thus limit proteolysis to that seemingly required to furnish nitrogen for their structure, and that toxin production in the pathogens is thereby correspondingly curtailed, this pioneer in bacterial chemistry with his coworkers at Harvard now confirms his earlier findings and demonstrates *quantitatively* the sparing action of dextrose for protein.

Without entering into the details and technique of the experiments and analyses, it may be said that ammonia determinations were made to give an index of the degree of proteolysis; the rate and change of reaction of media are also shown in the very interesting tables of determinations to estimate the acidity produced by fermentation of carbohydrate or alkalinity from putrefaction and the luxuriance of growth. Ammonia production in sugar-free broth exceeded that in the sugar broth, although growth was "decidedly more vigorous and extensive" in the latter. The pathogenic bacteria (colon, paratyphoid β , Shiga and typhoid) were less proteolytic than were the saprophytes.

While the cholera vibrio is noted for its proteolytic powers, there was hardly a mere trace of ammonia from decomposition of the dextrose broth. A nonvirulent strain of hog-cholera bacillus was more proteolytic than a virulent strain, although the latter induced almost the same acidity in sugar broth, indicating practically the same luxuriance of growth. The Flexner type of dysentery bacillus gave the same result as did the Shiga. An unidentified vibrio exhibited a marked tendency to assimilate ammonia for the first few days—a "negative ammonia phase" which has been noted in several pathogens, but the phenomenon is not explained.

B. pyocyaneus has its proteolytic power slightly restrained by the dextrose, although it does not utilize the latter. In sugar-free broth *B. mesentericus* broke down 25 per cent of the total protein nitrogen, while the dextrose broth restrained proteolysis to 1½ per cent in seven days, the former sixteen times as much as the latter. *B. diphtheria*, as is well known, produces little, if any, extracellular toxin in a broth containing sugar, and the slight excess of ammonia formed in the dextrose broth is significant. *M. aureus* appears to ferment the carbohydrate radical of the protein molecule (Witte's peptone), producing acidity even in a "sugar-free broth" for six days with but slow ammonia production; then, however, this carbohydrate radical is probably exhausted and the medium becomes strongly alkaline and ammonia formation suddenly increases—the carbohydrate can no longer spare the protein. The Shiga organism, pneumococcus, *S. pyogenes*, and streptococci generally also appear to possess a specific affinity for the carbohydrate radical of protein, coincident with the negative ammonia phase for the first few days.

This work is "fundamental" not only in the chemistry of bacteria but for clinical and preventive medicine, the import being that if carbohydrates may be made available to spare the body protein and restrict toxin formation, although growth may not be inhibited the body may develop its resistance before the toxin could become overwhelming.—(SURG. C. N. FISKE, U. S. NAVY.)

LONG, JOHN H. **The definition of normal urine.** Proceedings Soc. Biol. Chem., 1912, Jour. Biol. Chem., Vol. II, p. XI.

Our notions as to what is a normal urine have undergone many changes in the years which have elapsed since the first attempts were made to establish standards. The same individual, at one time on a high protein diet and again on a low protein diet, will excrete urine which may be markedly different in many ways and yet both be normal.

Improved methods of examination have shown that hyaline casts are much more frequently present in the urine of healthy men than was suspected a few years ago; and it must be admitted that traces of albumin occur in the urines of men who, from all ordinary points of view, are perfectly well.

The statement as to what constitutes normal urine must take cognizance of these facts, and of the further fact that for each individual there seem to be agencies at work which modify the nitrogen distribution, the acidity, and the neutral sulphur in ways which we can not account for. In a certain sense each individual has his own standard of normality.—(E. W. B.)

SAMMET, O. **The estimation of indican in urine.** Pharm. Zentr. h. 1912, vol. 53, pp. 585-9.

The technique of this method is very simple and is a modification of the convenient process of Folin. The urine (10 c. c.) is mixed with 2 c. c. of a 10 per cent copper sulphate solution and 12 c. c. of concentrated hydrochloric acid. The blue color formed (indigotin) is shaken out with chloroform and the intensity of the coloration compared with that of 10 c. c. of freshly prepared Fehling's solution, which is the standard. Folin denotes the coloration of the latter reagent as 100 and expresses the amount of indican in a sample of urine in terms of this quantity. The author, on the other hand, prefers to express the results in grams of indigotin or indican. The value of 100 in Folin's scale corresponds with 0.137 gm. of indigotin or 0.2228 gm. indican per liter.—(E. W. B.)

FOLIN, O., and FARMER, CHESTER J. **A new method for the determination of total nitrogen in urine.** Jour. Biol. Chem., Vol. II, No. 5, pp. 493-503.

The method represents a new departure in the adaptation of laboratory methods to clinical work. The process is described as a microchemical method based on the Kjeldahl procedure for decomposing nitrogenous materials and on the methods of Nessler and of Folin for the determination of ammonia. There is no distillation necessary and only apparatus of the simplest character is required. A result can be obtained in half an hour. The technique is as follows:

Five cubic centimeters of urine are measured into a 50 c. c. measuring flask. The flask is filled to the mark with water and inverted a few times to secure thorough mixing. One cubic centimeter of the diluted urine is then measured into a large test tube, made of Jena glass. A calibrated 1 c. c. pipette is used. To the urine in the test tube add 1 c. c. of concentrated sulphuric acid, 1 gm. of potassium sulphate, 1 drop of 5 per cent copper sulphate solution and a small clean quartz pebble (to prevent lumping). Boil over a microburner for about six minutes, i. e., about two minutes after the mixture has become colorless. Allow to cool about three minutes, then add about 6 c. c. of water, at first a few drops at a time, then more rapidly to prevent the mixture from solidifying. Now add 3 c. c. of a saturated solution of sodium hydrate and the ammonia is aspirated by means of a rapid air current into a 100 c. c. measuring flask containing about 20 c. c. of water and 2 c. c. of $n/10\text{HCl}$. The air current is to be continued for 10 minutes. This drives all of the ammonia into the hydrochloric acid solution.

Now disconnect, dilute the contents in the flask to about 60 c. c., and dilute similarly 1 mgm. of nitrogen in the form of ammonium sulphate to about the same volume in a second measuring flask. The latter serves as the standard. The ammonia is now determined by the Nessler method by adding Nessler's reagent (5 c. c.) to each flask. The relative intensity of color is determined by means of a colorimeter. The reading of the standard divided by the reading of the unknown gives the nitrogen in milligrams in the volume of urine taken.—(E. W. B.)

FOLIN, O., and MACALLUM, A. B. **On the determination of ammonia in urine.** Jour. Biol. Chem. Vol. II, No. 5, pp. 523-525.

The method here described is a microchemical procedure for ammonia in the same sense as the process for total nitrogen outlined in the preceding abstract. The technique is immensely simplified and the time enormously shortened as contrasted with the Folin method, on which it is based. The technique is as follows:

Into a test tube, measure, by means of a calibrated pipette, 1 to 5 c. c. of urine. Add to the urine a few drops of a solution containing 10 per cent of potassium carbonate and 15 per cent of potassium oxalate and a few drops of kerosene oil (to prevent foaming). Aspirate a strong air current through the mixture for 10 minutes. A water pressure of 40 to 45 pounds per square inch is available in most laboratories, and such a pressure will produce a sufficient air current, provided a good water pump is used. The ammonia collects in a 100 c. c. measuring flask containing about 20 c. c. of water and 2 c. c. of $n/10$ acid. Nesslerize as referred to in the preceding abstract and compare with 1 mgm. of nitrogen obtained from a standard ammonium sulphate solution and similarly Nesslerized. The figures obtained by this short, rapid method are practically identical with the data obtained by the old air-current method.—(E. W. B.)

EYE, EAR, NOSE, AND THROAT.

Passed Asst. Surg. G. B. TRIBLE, United States Navy.

RICHARDSON, CHARLES W. WASHINGTON, D. C. Tonsillectomy, with consideration of its complications. Washington Medical Annals, Vol. X, No. 2.

The author is of the opinion that, with the exception of hemorrhage, tonsillectomy is more liable to be followed by serious complication than tonsillotomy.

The patient requires preparation with as much care as for any major operation, and in the case of children he advises that cultures be taken to eliminate the possibility of the presence of the Klebs-Löffler bacillus. Examination of the urine should be made, since acute nephritis occasionally follows follicular tonsillitis.

The author favors the finger enucleation of the tonsil. In this the index finger is inserted between the tonsil and the anterior pillar at its upper third until there is a giving away of the tonsillar pillar mucosa, or it may be more convenient to enter between the top of the velar lobe and pass behind this into the fossa triangularis. The finger is then swept behind the capsule and the tonsil freed in all directions. When it is free, except the extreme lower portion, it is grasped by the forceps and evulsed.

The conditions for which the removal of tonsils is required or suggested are as follows.

1. Enlarged tonsils, either of the hypertrophic or hyperplastic type, which interfere with the breathing or the proper nutrition of the child, or when their diseased condition offers a menace to the health or well-being of the individual, or moderately enlarged tonsils, which seemingly cause and maintain infection of the cervical hyperplastic glands.

2. Tonsils subject to frequent acute infection, such as acute lacunar or follicular tonsillitis and peritonsillar abscess.

3. Chronic diseases of the tonsils, such as chronic lacunar diseases, mycosis tonsillaris, growths and calcareous concretions in the tonsils.

4. To prevent and mitigate certain constitutional diseases, in which the tonsils are the supposed port of entry, such as rheumatism, gout, tuberculosis, pleurisy, nephritis, endocarditis, bronchitis, pneumonia, appendicitis, meningitis, and hyperthyroidism.

It is a misfortune that operators fail to report the complications of this operation. The most frequent and dreaded complication of tonsillectomy is post-operative hemorrhage. Lindell Sewall reports 50 cases of serious hemorrhage, with 19 deaths. Another serious complication is hyperpyrexia, without known cause. In two cases, one reported by Dr. D. J. G. Wishart and the other by the author, following the operation the temperature soon rose to 107° F., and death followed in about 12 hours. Septic infarct of the lungs is an occasional complication, and a mild general sepsis often follows, but the more severe types of general sepsis are rare, in the author's opinion. Subcutaneous surgical emphysema is rare. Infection of lungs and serous membranes are frequent, though not usually reported. The existence of the status lymphaticus may be taken as the cause of death if an enlarged thymus is found on post mortem. Rarely an amygdalotomy rash occurs, but is of no consequence, except for the anxiety it may excite. It appears usually as a roseola, an erythema, or as papules in from two to three days following operation, and disappears after a few days.

Local disturbances after tonsillar operations probably occur more frequently than reported; they include hematoma, lateral pharyngeal abscess, injuries to the pillars and palatine arch. Infection of the middle ear is of occasional occurrence, though less frequently than after adenoid operations. Diphtheria has been reported following tonsil operations, though it can only be after operation on a carrier.

The author states in conclusion that he has been much impressed by the apparent indifference with which the laity and even a large part of the general medical profession view this operation, apparently regarding it a simple undertaking that can not be followed by unpleasant sequellæ and dangerous or fatal results. The facts brought forward would not only indicate that it is a very serious operation, but also that it may be attended with very serious and even fatal complications. With such knowledge, is it proper and wise to suggest this operation as a prophylactic measure, as is so often done by the internist with insufficient and inaccurate data, based purely upon local symptoms? The author believes that "a few general conditions probably have their portal of entry into the general system through the tonsils, but I would demand that in every

individual case the tonsil be first proved guilty before it is sacrificed." When suggesting such a procedure under such conditions one must hold steadfastly in mind the fact that we, by this operation, are exposing the patient to what may be a greater danger to his life than the probable remote infection.—(G. B. T.)

A. PASTEGA. Il protargola nell' antisepsi dell' apparato visivo (Protargol in antiseptics of the visual apparatus). *Annali di Med. Coloniale e Navale*, Vol. I, Fasc IV.

The author believes that the eye in normal state has a considerable resistance to infections, first by means of the tears, both from their mild antiseptic action and by the mechanical carrying away of infectious agents; the protective layers of epithelium of the conjunctiva; then the active conjunctival and scleral circulation.

The most frequent site for infectious agents he believes to be the margins of the lids, with the openings of the glands. The bacterial content of the lid margins are, of course, greatly augmented by a condition of blepharitis. The lachrymal sacs, when there is a condition of chronic conjunctivitis or a dacrocystitis, also contain many pathogenic organisms. After discussing the various common methods in use for lid and conjunctival disinfectants the author comes to the method of "*protargolage*."

First clean the lids and periorbital structures with soap solution, with vigorous rubbing with cotton, then rub with alcohol. Then cleanse with sterile water or boric acid solution, including the conjunctiva. Then 10 per cent protargol is flooded over the eye, the head being thrown back; the patient opens his eye gently. In applying, care is taken not to injure the cornea.

The protargol is left in contact about one minute; if operation is to follow, a bichloride dressing of approximately 1-1,000, covered by gutta percha, is applied.

The author reports numerous cases of trauma and numerous operations with no infection.—(G. B. T.)

LINDNER. The trachoma question. *Archives of Ophthalmology*, Vol. XLI, No. 4.

The author refers to the essay entitled "Cell inclusions of a parasitic nature in trachoma," by Halberstaedter and V. Prowazek, in which was described the dark-blue, granular inclusions of trachoma (smears stained by Giemsa's method) found in the protoplasm of the epithelial cells. These blue masses were termed *plastin* and were thought by the investigators to be a reaction product formed

by the action of the virus upon the cells. From these findings the investigators were convinced that trachoma is an epithelial cell infection and placed it side by side with lyssa, variola, molluscum contagiosum, etc., grouping these diseases under the name Chlamydozoa.

Many other investigators have confirmed these findings, and some have been of the opinion that Prowazek's inclusions are characteristic for trachoma, although the inclusions are hard to find. Their parasitic nature was not universally accepted.

At about this time first Stargardt and later Schmeichler each published a case of blennorrhoea neonatorum nongonorrhoeica with typical Prowazek's inclusions.

Then Heymann claimed to have found Prowazek's inclusions in four cases of gonoblennorrhoea in the new born.

These later findings were taken to mean that the inclusions were as much a reaction product of the epithelial cells against the gonococcus as against the agent of trachoma.

It had been known since shortly after the discovery of the gonococcus by Neisser in 1879 that blennorrhoea of the new born was **not** always due to the gonococcus. In many cases no gonococci were found, although the cases were of severe onset. Numerous other organisms have been assigned as a cause, viz, the Koch-Weeks bacillus, the pneumococcus, etc. However, in some cases no pathogenic bacteria were found; in some cases no bacteria of any kind. Axenfeld taught that these cases were probably due to injury at birth, while Morax held that they were due to a contagious agent not yet identified.

Upon the publication by Heymann of his finding, Prowazek's inclusions along with gonococci in blennorrhoea of the new born, those who were convinced of the parasitic nature of Prowazek's inclusions, of whom the author was one, immediately investigated the contention of Heymann. It was shown that Prowazek's inclusions were present in nearly all the cases of nongonorrhoeal blennorrhoea, but only present in a few cases in which the gonococcus was found. These inclusions could not be distinguished from Prowazek's inclusions, and the name "inclusion blennorrhoea" was applied by the author to these cases. The following description is given of inclusions:

In well fixed and stained sections they are blue, sharply outlined, round cocci-like bodies in the cavities of the protoplasm of the epithelial cells. Other times they are less dark and fine red spots are seen in the masses.

The blue bodies are described as being found extra cellular as well as intracellular.

Halberstaedter and V. Prowazek thought that these inclusions were similar morphologically to the causative agent of trachoma but not identical with it. Realizing that this virus in the nongonorrhoeal cases of blennorrhoea must come from the mother, they investigated

and found typical cell inclusions in the genital epithelium of a woman whose child had had an inclusion blennorrhea. They were of the opinion that this was a new virus because blennorrhea nongonorrheal was not looked upon clinically as trachoma.

The author was of the opinion that there existed a genital trachoma, and in proof inoculated monkeys with the inclusion blennorrhea, while animals can not be inoculated with any form of the gonococcus.

Later the author was able to find cell inclusions in male nongonorrheal urethritis.

In 1910 Wolfrum in Leipzig inoculated two men with inclusion blennorrhea. Genuine trachoma followed with scar tissue.

The inoculability of animals is, in the author's opinion, the most important proof, for of all the typical conjunctivitis only trachoma and inclusion blennorrhea can be transferred to monkeys.

While cell inclusions have been reported in other conditions, as spring catarrh, also in swine pest and epitheliosis desquamativa, morphological differences are shown, no inoculations can be made, and the diseases differ.—(G. B. T.)

WILSON, JAMES ALEXANDER. Keratitis as a cause of myopia. Ophthalmoscope, Vol. X, No. 7.

It is usually acknowledged that the eyes of infants, for instance, under 1 year of age are uniformly, or almost uniformly, hypermetropic. The myopic type exists prior to school age, but as it becomes more and more prevalent with the duration of school work this is accepted as an aggravating factor.

Equatorial pressure from the cone-shaped arrangement of muscles or from individual muscles is recognized as one of the principal factors. Others are of the opinion that a deficiency of the sclerotic in its posterial segment, of congenital origin, is the main factor.

In 100 cases of corneal opacities (both eyes affected in 79 cases) 69 per cent were found to be myopic. Astigmatism was very common, and in nearly two-thirds of the cases was found against the rule.

Excluding such cases as were merely hereditary myopia with added corneal complications, it is evident, in the author's opinion, that there is a relationship between myopia and keratitis, and that this relationship is greater than is acknowledged.—(G. B. T.)

REPORTS AND LETTERS.

FOURTH PROVISIONAL REGIMENT, UNITED STATES MARINES, CAMP THOMAS, NORTH ISLAND, SAN DIEGO, CAL.¹

By Passed Assistant Surgeon R. E. HORT, United States Navy.

On March 20, 1911, the Fourth Provisional Regiment of Marines, which had been quartered on the cruisers of the Pacific Fleet for the week previous, was sent ashore for encampment on a site selected at North Island, opposite the city of San Diego, Cal.

In granting permission for this encampment, the commander in chief stipulated that the regiment would be subject to recall to the ships on four hours' notice and that the command was in no way to be considered as detached from the squadron. With the expectation, therefore, of immediate reembarkation should orders arrive, the camp was of necessity considered but temporary and only equipment necessary for such temporary occupation was brought ashore. Furthermore, all sanitary recommendations and measures were based upon the supposition of temporary encampment until, with prolonged occupation, it became necessary to install more permanent arrangements.

The regiment consisted of 5 companies, organized into 2 battalions of 2 companies each, and 1 machine-gun company, with 15 commissioned officers of the line, 1 field officer (colonel commanding), 1 regimental surgeon, 1 quartermaster, and 1 regimental captain (adjutant), 2 quartermaster sergeants, an acting sergeant major, and Hospital Corps division from the Navy.

The camp site selected was on the northeastern end of North Island. The ground was clear and flat, with slight slope toward the bay on two sides. The surface was sparsely covered with grass, and the underlying soil was a fine, sandy gravel. To the south of the cleared area, on which the tents were pitched, was a thick overgrowth of sagebrush, extending to the farther side of the island. To the north and east of the camp the island sloped downward to the bay, and on both sides was clear sandy beach. To the westward was a large cleared area used as a parade and drill ground, and beyond

¹ Abstract of report received Sept. 15, 1911.

this for several miles the island was thickly covered with sagebrush. A better situation for a camp could hardly have been found. A practically uninhabited island with flat surface, dry, porous soil, with no marshland or standing water, and consequently no mosquitoes, fresh westerly breezes throughout the day, bright, sunny days, never disagreeably warm, very little rain, cool nights (often sufficiently cold to necessitate extra coverings for comfort), and excellent water supply—all contributed toward making camp life as nearly ideal as possible.

The ground on which the tents were pitched had been cleared and used some months previously as an exhibition ground by the Aero Club of San Diego, and consequently very little additional clearing was necessary before occupation.

A small house, with one occupant, was situated close to the shore on the northeastern corner of the island. On the opposite southern extremity were several buildings used by the Aero Club of San Diego.

The camp was arranged in 10 rows of 20 tents each, having 50-foot streets running east and west. At the eastern end of each company street was the company kitchen and store tent, and in their rear was the fresh-water pipe line, with faucet attachment for each company.

The company officers' tents were at the opposite end of the streets, facing eastward. Back of this row, a 50-foot street intervening, was the staff officers' row, and behind this line were the commanding officer's quarters, officers' mess tent, and kitchen. Tents belonging to the quartermaster's department were situated at the northeastern end of the island, close to the landing. The field hospital was on the left flank of the camp to the north of the company streets. Latrines were about 200 feet distant on the right flank of company tents.

The tents used by four of the companies were the regulation khaki wall tents. The fifth company used the conical Sibley type. Two, and in some cases three, men occupied one tent. Staff officers occupied hospital tents.

As all the men were furnished with cots and as the ground was at all times dry, no floors were necessary in the tents. The sides and ends of all tents were kept rolled up throughout the day, thus allowing exposure of the interior to sunlight, thorough ventilation, and drying. Routine inspections of tents with their contents were made daily.

Each man was furnished with a regulation marine blanket, but on many nights these proved insufficient, and shelter tents, ponchos, and articles of clothing were often used in order to protect from the cold. It was not unusual during the latter part of March and throughout April for the temperature to drop 15° and 20° after sunset. In spite of these discomforts, however, very little actual illness

resulted, and after the first week or two complaints of "colds" and "rheumatism" were seldom heard.

The companies were subsisted on the Navy ration. All meats obtained from San Diego were fresh and of excellent quality. The preparation of food was most satisfactory and was furnished in ample quantities.

Particular attention was paid to the subsistence department, as is necessary in all camps. Kitchens, storerooms, cooking utensils, mess gear, and water and food were most rigidly inspected at frequent intervals. Instruction was given to cooks and messmen as to the importance of thorough cleanliness, protection of food, and danger from flies. The store tents were kept in excellent order at all times, and articles of food were covered with cheesecloth or mosquito netting until actually used.

A small temporary store was started by a civilian from San Diego, where tobacco, cigars, cakes, candies, and fresh fruits could be purchased at reasonable rates. A similar store was instituted by the naval branch of the Y. M. C. A. in conjunction with their recreation tents, and soft drinks, ice cream, candies, and smoking material could be obtained here also. These stores were subject to rigid inspection daily.

No illnesses have appeared which could in any way be attributed to improper food, nor have there been any complaints as to quantity and quality; in fact, from the very evident gain in weight and improved appearances of the men as a whole the fact is conclusive that the commissary department has been doing its share in conducting to health and comfort.

The water, already piped to the island, was from the same source as that in San Diego and Coronado. Previous to encampment, it had been thoroughly investigated and found to meet all requirements as regards purity. Tests after the establishment of camp showed a rather high percentage of salt, but the proximity of the source to the ocean satisfactorily explained this condition.

The supply pipe was laid in the rear of the company kitchens, and an upright, with faucet attachment, was furnished for each company. A second supply pipe was led along the right flank of the camp to the officers' kitchen. Two branches from this lead supplied water to the men's shower bath, at the southeast corner of the camp, and to the officers' bath at the northeast corner.

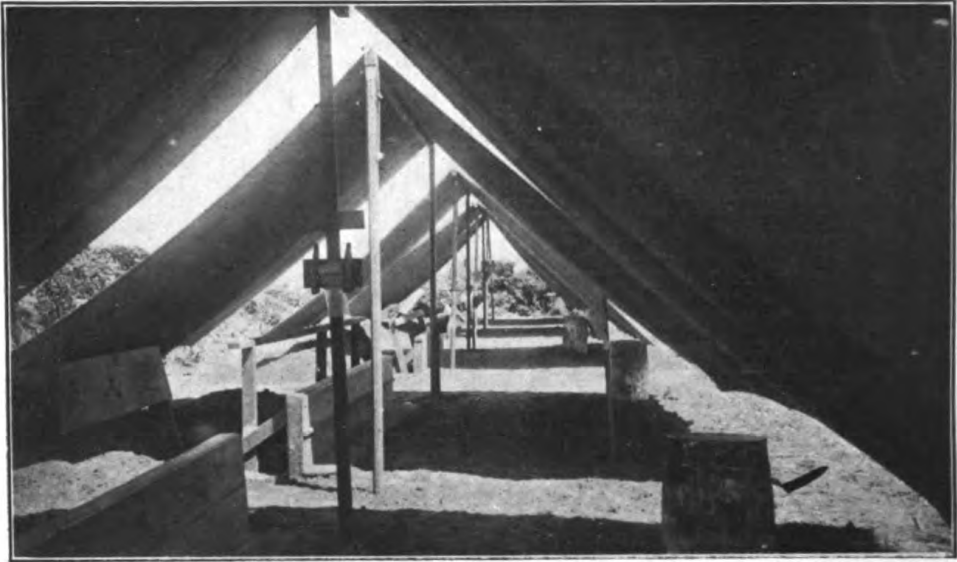
Tables for scrubbing clothes were erected in the rear of the pipe line back of the kitchens. During the first two weeks of occupation the waste water from these tables, as well as the overflow about faucets, was disposed of by digging pits beneath each table and faucet and filling in with sagebrush or broken stone, in this manner preventing surface accumulations of dirty water. It was found,

however, that these pits became filled after a time, the soap and grease depositing on the sides and preventing the surrounding soil from absorbing the liquid. The pit system was therefore discontinued, and a 4-inch porous farmer's drainpipe was laid about 2 feet beneath the surface, extending from the southeastern corner of the camp to the shore on the northern side. The natural downward slope of the island gave sufficient pitch to insure rapid removal of all water through the drain. Brick and cement catch basins were erected beneath each of the wash tables and in front of each faucet, and these were connected to the main drainpipe by short lateral branches. By this means all wash and waste water was promptly removed, and the ground about the tables and faucets remained dry. These excellent facilities for washing of clothes proved very conducive to cleanliness, and the tables were constantly employed. Clothing of officers and soiled articles from the field hospital were washed by the laundries in San Diego.

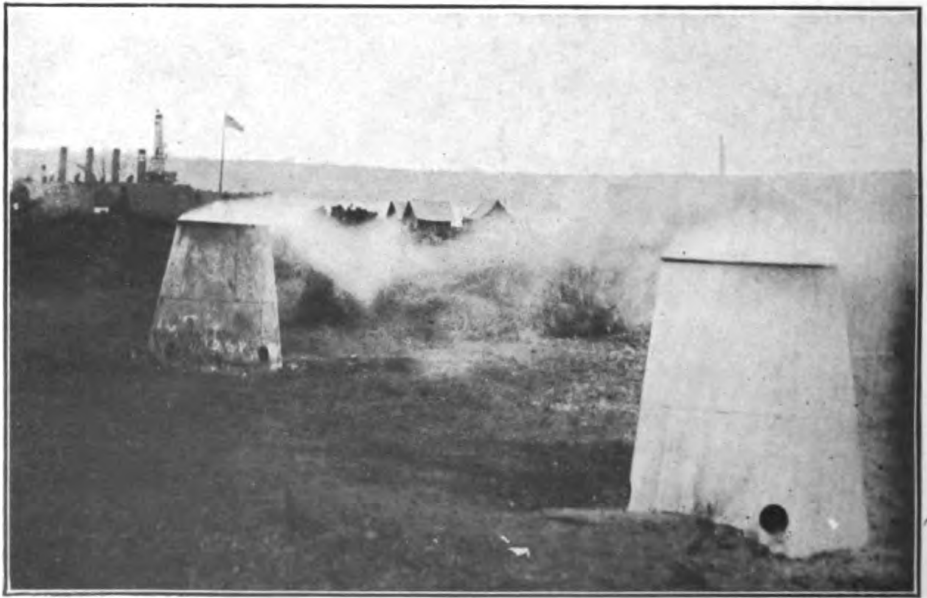
The bathing facilities were very satisfactory. A wooden building, without roof, about 25 by 8 feet, was erected at the southeastern corner of the camp and used as a bathhouse for the men. The building was placed on a large pit previously dug and filled with sagebrush and broken stone and loosely covered with boards. A pipe was led into this inclosure, and four shower-bath connections were made to it. The "shower" effect was obtained by hanging small tin pails with perforated bottoms over the ends of the pipes. Each shower was controlled by a separate valve. As in the case of the wash sinks, it was found necessary to provide permanent drainage for the pit beneath this shelter in order to remove the waste water. This was done by laying another drainpipe from the pit to the eastern shore. A similar shelter was erected at the opposite southern corner of the camp, to be used as a bathhouse by the officers, and the arrangement was similar to that in the men's inclosure, except that the pit beneath was not drained, as the ground carried away the waste sufficiently rapidly. Fresh water in unlimited quantities was available not only at these bathhouses but also at the faucets, and the men could at any time obtain sufficient for washing of hands and face. A few men bathed in the bay, but the water was at all times rather too cold for general swimming parties, and the danger of wounds from sting-rays prevented many from availing themselves of this means of cleanliness and sport.

General policing of the camp was performed twice daily—in the morning by the entire command and in the afternoon by squads of prisoners and extra-duty men.

Incinerator men and "captains of the heads" were detailed from those incapacitated in slight degrees for the more active drills and duties. Kitchen refuse and garbage was collected in large covered galvanized-iron cans furnished to each company, the liquid in one and



LATRINES, CAMP THOMAS, SAN DIEGO, CAL.



INCINERATORS, CAMP THOMAS, SAN DIEGO, CAL.

solid in another. The cans were hauled away after each meal. The liquid refuse was dumped into a "liquid-refuse pit." This pit was about 10 feet square and 8 feet deep. Over this a wooden flooring was placed about 6 inches from the surface, and on this a layer of soil, bringing the level up to the surrounding ground. At one corner of this platform was an opening fitted with a wooden shaft provided with a screen. The liquid refuse was carefully emptied into this pit through the shaft, which was kept covered when not actually in use. Later it became necessary to drain this pit, and a drain pipe was laid a few feet beneath the surface from one corner of the pit to the drain running from the men's shower bath. By this means all dirty water and liquid refuse of whatever nature was quickly disposed of without contamination of the surface.

The solid refuse was burned in two incinerators built for the purpose. These incinerators were made of heavy galvanized iron, were conical in shape, 4 feet high, 5 feet in diameter at the base, and $3\frac{1}{2}$ feet at the top. Four round openings 8 inches in diameter at about a foot from the base served to furnish the necessary draft. Old grate bars were obtained from the ships, and were arranged on bricks about a foot from the surface of the ground, and over these grates the incinerators were placed. A fire started in the morning by brushwood was kept up throughout the day by refuse and garbage from the camp; in fact, everything burnable was disposed of in this way. One incinerator proved sufficient for the disposal of all waste, but after several days of use it would become necessary to remove the outer covering and clean away the ashes; meanwhile the other incinerator would be started. All refuse which could not thus be destroyed, such as tin cans, ashes, etc., was buried in pits dug just beyond the incinerators. The accompanying photograph shows the incinerators as installed.

The latrines, one for each company, were situated on the right flank of the camp about 200 feet distant and in a line running east and west. Each latrine consisted of a deep trench 20 feet long, 10 feet deep, and $2\frac{1}{2}$ feet wide. Over this was erected a wooden seat and an upright for a back. Each trench was covered by a tent fly and the sides and ends were screened by sagebrush. The seats, foot-board, and back were scrubbed daily and the pits were sprinkled with crude oil and earth twice daily. Tarred paper was used on the inner side of the vertical portion of the seats and was replaced at frequent intervals. The ground about these latrines was kept thoroughly policed at all times.

Sprinkling the ground beneath the tent shelter with oil served to lay dust and prevent the entrance of flies. When the trenches became shallow they were filled in to the surface and new pits dug.

Toilet paper was provided at each latrine and kept in protected boxes to prevent blowing about the camp.

By the liberal use of oil, constant cleanliness of ground and seats, cold nights and fresh breezes blowing through the line of latrines, very few flies were noticed, and then only during the warmer and quieter midday hours.

The oil and fresh breezes were also responsible for the absence of odor about these trenches. For this particular locality and with the excellent facilities for thorough policing and constant inspections the open latrine has proven very satisfactory. With the open seats the pit is at all times available for thorough inspection, oil can be more easily and more lavishly applied, and the filling in with earth done more satisfactorily. The pit is properly ventilated, odors are dissipated, and seats, inside as well as out, are more accessible for scrubbing. The one great advantage of the closed seats—the keeping out of flies—can be easily equalized by the liberal use of crude oil and prompt covering in of fecal matter by a thin layer of earth. The arrangement has given the greatest satisfaction for the entire period of encampment. At one end of each trench was a sloping trough, used as a urinal, and this prevented the soiling of latrine seats.

A latrine similarly arranged was placed on the beach back of the field hospital for use of patients. The officers' latrine was situated on a line with company trenches and about 300 feet to the westward. The trench was covered by a building divided into six closets with closed seats. The policing here was most thorough, and the trench was treated with oil and earth, as in the case of the company pits.

Night urinal cans were placed in each company street and officers' streets nightly, and undoubtedly proved of great value in preventing soil pollution by men who otherwise would have used the ground rather than walk to a latrine.

For lighting purposes at night the men were furnished with candles—a most unsatisfactory means of illumination. Officers' tents were furnished with large table lamps and lanterns. Company streets were lighted by lanterns hung on poles erected for the purpose at the ends of each street.

During the latter part of May and throughout June the naval branch of the Y. M. C. A. had a large recreation tent on the grounds, well lighted at night and furnishing a most convenient place for men to write letters, read, or play games. The period between sundown and taps proved rather disagreeable for the men in general, as, owing to the very abrupt drop in temperature and marked chilliness of the air, together with very poor lighting facilities, there was practically nothing for them to do but shut themselves in their tents and turn in for comfort. The recreation tent was a most welcome innovation on this account and was most fully patronized.

During the early days of the encampment, owing to the large amount of work to be done and drills necessary to bring the men to the required degree of efficiency for active service, there was very little time for recreation, nor did the men feel the need of any further exercise in that direction.

Later, as the work became lighter and drills less strenuous, baseball, swimming, and walks about the island were the chief forms of diversion.

During the first month liberty was granted to men from 7 p. m. to 1 a. m. daily, and from noon to 1 a. m. on Saturdays and Sundays. Later, when the situation became less critical, the time was extended to all night liberty and Wednesday afternoons as well as Saturdays and Sundays were given.

The health of the command in general has been excellent. During the first week, and until the men became acclimated, complaints of colds, sore throats, and tonsillitis of a mild grade were rather frequent, but the affections were not of sufficient gravity to incapacitate for duty and were quickly recovered from. After the first week or 10 days it was very rare to hear complaints of this kind, and during the last two months a cold was unheard of.

Owing to the constant drilling and hikes about the island during the first two weeks, a large number of recruits presented themselves at sick call with physical defects which, being overlooked or unnoticed on enlistment, were now causing symptoms sufficient to incapacitate them for duty. Of the 500 men about 8 per cent voluntarily presented themselves in this way and were found unfit for active expeditionary service on account of physical defects, most of which clearly existed prior to enlistment.

* * * * *

From the total number of men thus incapacitated during the first days of the encampment it was necessary to survey nine, and they were sent to the naval hospital at Mare Island for further disposition. Many others were given special details about the camp.

In addition to the nine men sent to the hospital on first landing, four other patients were sent north for hospital treatment during the encampment. One case of obstinate recurring iritis, one asthma with chronic emphysema, one chronic amebic dysentery of several years' standing, and one old syphilitic case with laryngeal involvement.

On the 3d of April a case of measles appeared. The patient had been quartered on the U. S. S. *South Dakota* two weeks previous to landing, and at that time several cases of measles were being treated on board. One more case appeared the next day, also from the company quartered on the *South Dakota*.

Isolation tents were pitched at a proper distance from the camp and convenient to the field hospital and the two patients were treated

here. The tent mates of the affected men were also placed in quarantine. The tents and all clothing and furnishings within were thoroughly disinfected by formaldehyde vapor. Tents were then taken down and spread on the ground away from the camp for several days. The ground formerly covered by tents was policed and left exposed to the sun for one week before new tents were pitched. Two weeks after the appearance of the first two cases one other man contracted the disease. Investigation showed that he had occupied the tent immediately in the rear of one occupied by the first men affected. The same methods of isolation and disinfection were adopted as with the first case, and men occupying the tent with patient were quarantined for two weeks. No other cases appeared. In addition to the 3 cases from camp there were 15 or 20 sent ashore from the fleet and were isolated and treated at the camp isolation hospital.

One patient admitted on April 23 with acute uremic poisoning died eight hours after admission to hospital.

Eliminating those cases contracted prior to encampment, there have been only 7 original admissions for venereal disease, 6 for gonorrhea and 1 for chancroid.

One tent of the field hospital division was equipped and employed solely for the purpose of affording opportunity for prophylactic treatment to men returning from liberty. A hospital apprentice was assigned to duty here with instructions to check off liberty men who reported, to inquire as to possible exposure to venereal infection, to make a record of replies, and to instruct in the use of means to prevent diseases.

The prophylactic measures that are commonly used on ships were employed—soap and water, bichloride, argyrol injection, and calomel ointment.

For the first two months all men returning from liberty were required to report to the field hospital. Later, however, as the men themselves realized the benefits and importance of the treatment, only those who had exposed themselves to possible infection were required to report.

During the period of encampment there have been 9,510 liberties. On return from liberty 894 men have admitted exposure and taken prophylactic treatment.

Two of the six men admitted with gonorrhea and one admitted with chancroid denied exposure and did not take prophylactic treatment on return from liberty. The remaining four patients became infected notwithstanding the treatment. This gives a result of practically 0.44 plus of 1 per cent infected following possible exposure to infection and taking prophylactic treatment.

Beyond the cases previously mentioned there have been practically none admitted in any way remarkable or peculiar to camp life. The

absence of typhoid, dysentery, or diarrheal diseases has been consistent with the rigid sanitary methods employed for their prevention.

The entire command was examined for evidences of successful vaccination, and all not showing recent scars and those not vaccinated within one year were revaccinated. Two hundred and nine officers and men were thus treated. Fourteen, or 6.66 per cent of these, proved successful. It should be stated that all men coming from Bremerton and Honolulu and the majority from Mare Island were vaccinated a very short time before embarkation.

The field hospital was located on the left flank of the camp proper, about 200 feet distant and about the same distance from the beach on the northern end of the island. It consisted of 6 hospital tents, 1 used for hospital apprentices' quarters, 1 store tent, 1 dispensary and dressing tent, and 1 venereal prophylactic tent. Two, pitched with ends adjoining and space in front of first tent protected by an extra fly, served as "hospital ward tents." These were furnished with the cots, tables, chairs, etc., supplied in the field hospital outfit. Field operating equipment and surgical dressing, as well as a few of the dispensary supplies, were kept in the dispensary tent. The store tent contained all supplies not immediately needed.

The personnel consisted of a medical officer, hospital steward, three hospital apprentices first class, and three hospital apprentices.

For field hospital service 10 Army litters, Hospital Corps pouches, large and small, and an extra supply of first-aid packets were furnished. In addition to the first-aid packets in the medical supplies there were 500 among the quartermaster stores.

The equipment proved sufficient for a force of this size for about two months. After that it became necessary to obtain various articles from the ships, chiefly material for dressings, drugs in common use, and disinfectants.

Routine instruction in first aid was given daily. Four men from each company reported at the field hospital for three successive days to receive this instruction, which consisted in application of first-aid dressings, control of hemorrhage, application of splints, treatment of shock and collapse, and the methods of transporting injured. After three days a fresh squad was started.

The "first-aid" division for each company consisted of one hospital apprentice, carrying small Hospital Corps pouch with extra dressings and tincture of iodine in addition to its regular outfit, and two stretcher squads of two men each, who had received special instruction in litter bearing. These squads followed their respective companies at drills and received practical instruction in first-aid treatment on the field.

On June 24, in compliance with instructions from headquarters, three companies of the regiment were transferred to the cruisers for passage to the navy yards at Mare Island and Bremerton.

Two companies of 100 men, hospital division, and 8 officers remained in camp.

It was considered advisable at this time, owing to the prolonged occupation of one camp site, to recommend a change, and in accordance with this recommendation on June 27 the command was transferred to grounds on Coronado Island.

The hygienic and sanitary features of the new camp were similar in all respects to those of the former site.

On July 10 orders were received for the remaining companies to embark on the *Colorado* for passage to Mare Island, and the camp was accordingly broken at that time.

During the entire period of encampment the daily average of sick was 2.9. Percentage of sick was sixty-eight one-hundredths of 1 per cent, and total sick days amounted to 322.

MARINE EXPEDITIONARY FORCE, PEKING, CHINA.

MARCH-MAY, 1912.¹

By Assistant Surgeon R. B. HENRY, United States Navy.

The two companies of marines composing this force, accompanied by one medical officer and eight Hospital Corps men, were embarked upon the U. S. S. *Abarenda* on March 5, 1912, from the U. S. S. *Rainbow*.

The expedition arrived in Peking on the evening of March 10, and the command was split into four detachments of half a company each to guard four missions in widely separated parts of the Tartar city. Headquarters were established at the Methodist Episcopal Mission, which is in a large and easily protected compound adjacent to the south wall of the city, about a mile east of the American Legation. This compound would be the place of refuge for persons from the other missions, and, except under extreme conditions, it would not be necessary to retreat to the legation quarter. Communication between the missions was maintained by signal and telephone, as well as by daily trips of the patrol.

The following distribution of the Hospital Corps was made: At the Methodist Episcopal Mission (headquarters), two hospital stewards, one hospital apprentice first class, and two hospital apprentices; at the American Board Mission, about 1 mile north of the legation quarter, one hospital apprentice; at the East Presbyterian Mission, 2 miles north of the American Board Mission, one hospital apprentice; and at the West Presbyterian Mission, 2 miles northwest of the American Board Mission, one hospital apprentice first class.

Cases needing special attention were transferred to the sick bay at headquarters, where there were ample facilities for treatment. The bacteriological work, the distribution of supplies, and most of the paper work were also handled here. Sick call was held at headquarters every morning by the medical

¹ Abstract of Sanitary Report, received June 26, 1912.

officer and reports received from the Hospital Corps men at the other missions. These were visited at frequent intervals in addition to any special call. Missionary physicians, whose services would be available in case of any sudden emergency, resided at three of the four missions. Each of the three outlying missions was supplied with a detached service chest, the necessary materials for carrying on venereal prophylaxis and a few extra drugs drawn from the large supply kept on hand at headquarters.

The men were quartered in well-ventilated rooms, which were heated during cold weather, and sufficient bathing facilities, with hot and cold water, were provided at all missions. The use of uncooked food, except peeled fruits, was forbidden, and all drinking water was boiled and kept in covered tanks. Kitchen refuse was placed in covered jars pending removal by coolies, and steps were taken to screen, as far as practicable, the kitchens and mess rooms in anticipation of the fly season, but owing to withdrawal from Peking only a portion of the work was actually completed.

"Heads" were constructed, the seats being closed by hinged covers, and no openings permitted that would admit flies to the discharges. The feces and urine were received in tins, which were regularly removed and emptied by coolies.

The climate of Peking is dry, stimulating, and though warm in summer is probably as fine as any in China. The dust storms are frequent and annoying, but do not appear to be injurious. The water supply is mainly from shallow wells, and drinking water should always be boiled. There is no sewage system, the pail system being in vogue and the excreta being carted away for fertilizing purposes. The health of the men during the stay in Peking was excellent; in the month of April, the whole of which was spent there, except for the usual run of venereal cases and one case of myalgia there were no admissions to the sick list. If suitable quarters could be obtained, or a good camping site in the warmer months, it would be difficult to find a more satisfactory place, from a medical standpoint, for maintaining a body of troops. The objection to living in Chinese compounds is that in the immediate vicinity are hundreds of natives who ignore every principle of sanitation and leave their bodily discharges in the open, and with the onset of the fly season prove a menace to all in the neighborhood.

In the hills a few miles west of Peking are a number of temples for rent, which offer a satisfactory escape from the heat of the summer, which is in no small measure due to the cutting off of all breezes by the city walls. Mosquitoes are plentiful in summer, and nets are a necessity.

The antityphoid vaccination was administered to the command in accordance with the department's orders on the subject and guided by instructions from the commander in chief.

The question of uniform deserves consideration. The naval uniforms would make an easy target, and for other obvious reasons are not satisfactory in the field. The men of the Hospital Corps should be allowed to wear the uniforms of the corresponding ratings in the Marine Corps, with the addition of a red cross on the sleeve.

The medical officers should be authorized to wear a uniform of the same material as that worn by Marine officers, with breeches where proper. This, however, should not interfere with the use of the present white uniform under circumstances where its use would be appropriate, as under such conditions nothing more satisfactory could be devised.

The expeditionary force remained in Peking until May 6, on which date it entrained for Taku and reembarked on the U. S. S. *Rainbow*.

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